Orthoptera from Gunung Arong Forest Reserve, Johor, Peninsular Malaysia

Amira Aqilah Muhammad[1,2], Ming Kai Tan[3], Izz Amirul Azizan[1], Nurul Ashikin Abdullah[1]

1 Institute of Biological Sciences, Faculty of Science, Universiti Malaya, Kuala Lumpur 50603, Malaysia.
2 Rimba Ilmu Botanical Garden, Universiti Malaya, Kuala Lumpur 50603, Malaysia.
3 Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore, 2 Conservatory Drive, Singapore 117377, Singapore.

Corresponding authors: Amira Aqilah Muhammad (miamedulla@gmail.com), Ming Kai Tan (orthoptera.mingkai@gmail.com)

Academic editor: Klaus-Gerhard Heller | Received 20 May 2025 | Accepted 16 August 2025 | Published 23 January 2026

https://zoobank.org/71AD981E-70C7-4A16-ACD2-47D994154885

Citation: Muhammad AA, Tan MK, Azizan IA, Abdullah NA (2026) Orthoptera from Gunung Arong Forest Reserve, Johor, Peninsular Malaysia. Journal of Orthoptera Research 35(1): 117–156. https://doi.org/10.3897/jor.35.159566

Abstract

A recent scientific expedition held in Gunung Arong Forest Reserve (GAFR) in Mersing, Johor, Peninsular Malaysia was conducted to document the species richness of Orthoptera. This survey aimed to fill knowledge gaps in Orthoptera from Malay Peninsula, in which traditionally little is known for Johor state compared to Pahang state in the north and Singapore to the south. Opportunistic surveys along selected trails culminated in a total of 62 taxa representing 12 families. Our study revealed a wider distribution for some species thought to be endemic to Singapore—*Singapuriola*, *Ectatoderus angusticollis* Chopard, 1969, *Ornebius xinyao* Tan, 2015, and *Cesasundana lorniensis* Tan, 2014. Likewise, *Odontogryllodes undatus* Tan, Muhammad & Abdullah, 2024 and *Parendacustes* (*Parendacustes*) *aduncus* Tan, Muhammad & Gorochov, 2024 are two species only recently discovered from Panti Forest Reserve that were also found in GAFR.

Keywords

Checklist, Kerangas forest, new locality record, peat swamp, Southeast Asia, taxonomy

Introduction

Little is known about the orthopteran in the southern parts of Peninsular Malaysia (i.e., Johor state) compared to Pahang and the northern parts of Malaysia as well as Singapore to the south of Johor state (Tan et al. 2017). More recently, the study of Orthoptera is gaining attention in southern parts of Peninsular Malaysia, but they are focused within certain localities such as Tioman Island (Gorochov 2011a, 2011b, 2012, 2013, 2016, 2017, Gorochov et al. 2018) and Panti Forest Reserve (Tan et al. 2024a, 2024b, 2024c, 2024d). However, these two localities represent small parts of southern Peninsular Malaysia.

Located in the eastern part of Johor state, Gunung Arong Forest Reserve (GAFR) is divided into five forest strata: lowland dipterocarp forest, mangrove forest, peat swamp forest, freshwater swamp forest, and Sundaland heath (Kerangas) forest (Johor State Forestry Department 2024). In 1926, the 20,000-hectare forest was gazetted as a permanent forest reserve under the National Forestry Enactment (Usage) 1985 (Johor State Forestry Department 2024). Even though it has been nearly a century since its gazettement, studies on invertebrates in GAFR are few. There are noteworthy studies on lepidopterans (Aqilah 2019, Aqilah and Mohamed 2019) and odonates (Abdul-Aziz 2018); however, there is hitherto no published record of Orthoptera from Gunung Arong.

Situated between these two localities, GAFR serves as an important site for orthopteran studies as it can help bridge the knowledge gap in species diversity and the distribution of orthopterans. This study provides the first checklist of Orthoptera from GAFR, with new locality records, taxonomic remarks, natural history, and bioacoustic notes of the orthopteran species collected.

Material and methods

Sampling.—Surveys were conducted within GAFR from September 17 to 21, 2024 (by A. A. Muhammad, I. A. Azizan and N. A. Abdullah), and April 10 to 15, 2025 (by M. K. Tan and A. A. Muhammad). Opportunistic collecting was conducted in the morning (0830 to 1200 hours), afternoon (1300 to 1700 hours), and night (2000 to 2300 hours) at selected trails (Fig. 1). A total of 11 trails were surveyed: Trail 2 (Fig. 2A), Trail 3 (Fig. 2B), Trail 4, Trail 7, Trail 8 (Fig. 2C), Trail 10, Trail 12 (Fig. 2D), Trail 13 (Fig. 2E), Trail 14 (Fig. 2F), Trail 16 (Fig. 2G), and a freshwater swamp trail (Fig. 1). In situ photographs were taken using an Olympus OM-D E-M5 Mark II interchangeable lens camera with M.Zuiko Digital ED 60 mm F2.8 Macro lens and a Godox Macro Ring Flash ML-150 attached, and a Canon EOS 500D digital SLR camera with a compact-macro lens EF 100 mm f/2.8 Macro USM and Canon Macro Twin Lite MT-24EX was used for lighting and flash.

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Recording and analyses of calling songs.—The calling songs of male crickets or katydids were recorded in captivity. Each male was placed in isolation in a small insect cage and the sound recorded continuously using a Wildlife Acoustics Song Meter (SM) Mini acoustic recorder. The recorded signals were saved in 12-bit WAV format, and the calling songs were obtained from these signals.

The basic katydid song terminology follows Baker and Chesmore (2020) and Tan et al. (2023). Parameters of the temporal domain (e.g., call duration/period and interval) were measured manually using Raven Lite 2.0.0. For frequency domain parameters, energy peaks were obtained using the 'spectro_analysis' function from the R package warbleR version 1.1.27 (Araya-Salas and Smith-Vidaurre 2017) in the R software version 4.4.1.

Specimen curation and examination of material.—The specimens collected were preserved in absolute analytical-grade ethanol and later pinned and dry-preserved. The dissection of the male titillators or phallus was performed by removing them from the abdominal apex of softened specimens before they were cleaned using aqueous potassium hydroxide (KOH) and preserved in glycerine.

The morphological features and male genitalia of the specimens were photographed with the aid of external lighting from a PULUZ Folding Portable 550LM Light Photo Lighting Studio Shooting Tent Box Kit with a white backdrop attached. Alternatively, the pinned specimens were imaged using a Canon EOS 6D digital SLR camera attached to a Visionary Digital Passport system, a macro photo lens MP-E 65 mm f/2.8 USM (1–5×). Image stacking was done using Zerene Stacker version 1.04. Close-up images were obtained using a Leica M205C Encoded stereomicroscope. Image stacking was done using the Leica Focus Stacking Imaging System operated within Leica Application Suite X. Adobe Photoshop CC 2014 (Adobe Systems Incorporated, San Jose, CA, USA) was utilized for image editing.

Specimen identification.—Both authors identified the specimens using relevant published keys (Bolívar 1887, Karny 1926, Willemse 1930, 1957, 2001, de Jong 1939, Chopard 1969, Hollis 1971, Gorochov 1985, 1993, 2002, 2011a, 2011b, 2012, 2013, 2015a, 2015b, 2016, 2017, 2020, Ingrisch and Willemse 1988, Ingrisch 1998, 2006, 2011, Buzzetti and Devriese 2008, Gorochov and Tan 2012, Ingrisch and Tan 2012, Tan 2012, 2014a, 2014b, 2017, Huang et al. 2013, Robillard and Tan 2013, Robillard et al. 2014, Tan and Ingrisch 2014, Tan and Kamruddin 2014, 2016a, 2016b, Tumbrinck 2014, 2019, Dawwrueng et al. 2017, Gorochov et al. 2018, Lu et al. 2018, Muhammad et al. 2018, Tan et al. 2015, 2016, 2019, 2021a, 2021b, 2024a, 2024b, 2024c, 2024d, Heller et al. 2021, Adžić 2021, Neo et al. 2024, Rahim et al. 2024). Classification and nomenclature follow that of the Orthoptera Species File (OSF) (Cigliano et al. 2025).

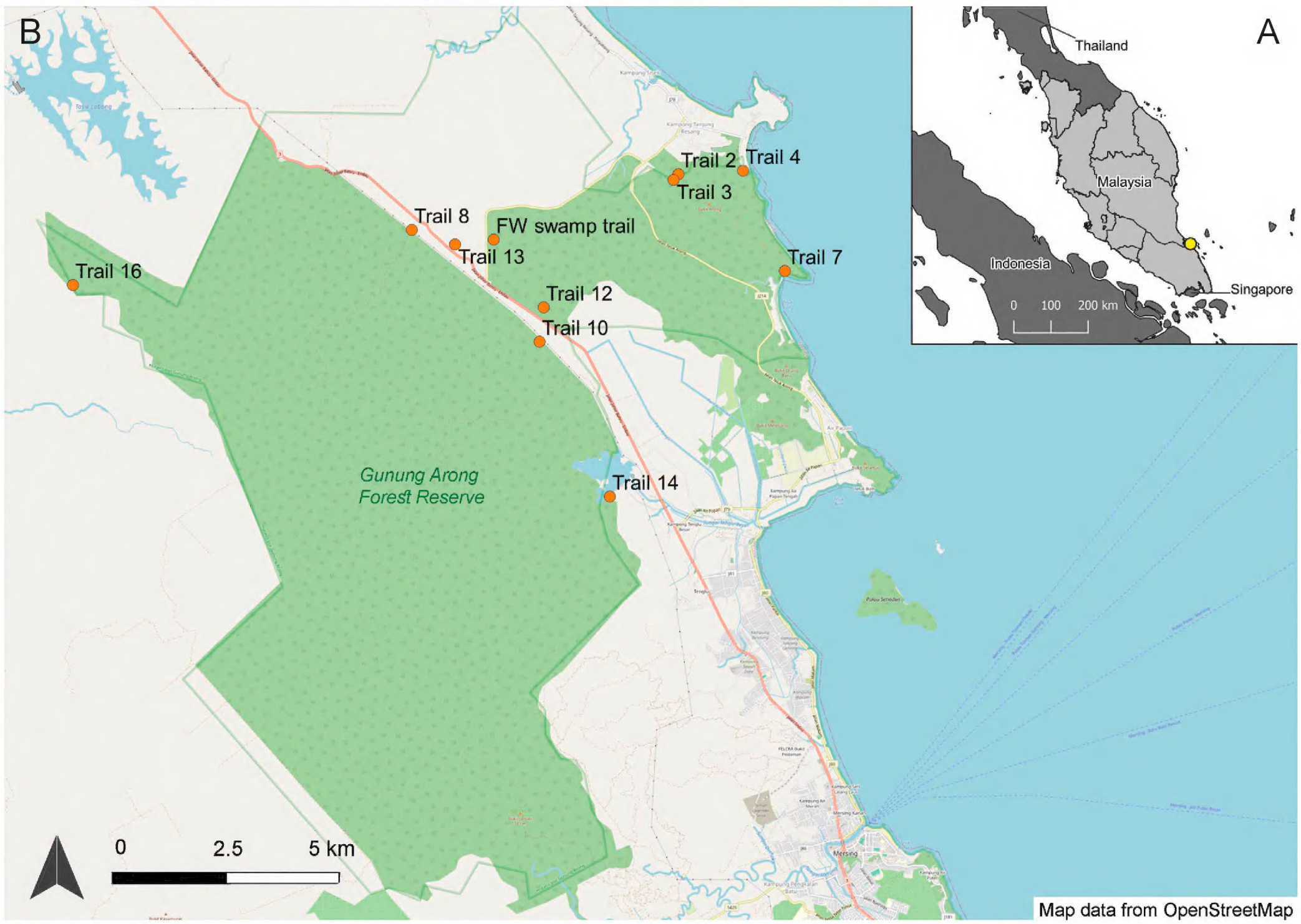

Fig. 1. A. Map of Peninsular Malaysia, with the yellow dot indicating Gunung Arong Forest Reserve. **B.** Gunung Arong Forest Reserve in Mersing district, with the orange dots indicating the trails sampled in this study. Map retrieved from OpenStreetMap at https://www.openstreetmap.org/copyright.

Fig. 2. Environment of the selected sites within Gunung Arong Forest Reserve: **A.** Trail 2, **B.** Trail 3, **C.** Trail 8, **D.** Trail 12, **E.** Trail 13, **F.** Trail 14, and **G.** Trail 16.

Depository.—All specimens collected are deposited in the Museum of Zoology, Universiti Malaya (MZUM) in Kuala Lumpur, Malaysia and the Zoological Reference Collection (ZRC) Lee Kong Chian Natural History Museum in Singapore.

Results

A total of 62 taxa representing 12 families were collected. For the suborder Caelifera, 23 taxa from 3 families and 10 subfamilies were collected. The most speciose family is the Acrididae, consisting of 12 taxa, followed by Tetrigidae (10 taxa), and Pyrgomorphidae (one taxon). For the suborder Ensifera, 39 taxa from 9 families and 20 subfamilies were collected. The most speciose family is the Tettigoniidae, consisting of 12 taxa, followed by Gryllidae (10 taxa), Mogoplistidae (five taxa), and Oecanthidae (four taxa). The families Gryllacrididae, Phalangopsidae, Pteroplistidae, Rhaphidophoridae, and Trigonidiidae are represented by two or less taxa each.

Checklist

Suborder Caelifera
Family Acrididae
Subfamily Acridinae

Acrida willemsei **Dirsh, 1954**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Pantai Teluk Gorek; 2.54058°N, 103.82172°E, 8.5 m.a.s.l.; 20 September 2024; 13h24; on grassy patch under a tree by the beach; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.109, MZUM.

Remarks.—This species is characterized by an acutely conical head and slender, green or brown body with pink hind wings. A number of species have been recorded in Southeast Asia and closely resemble each other. Widespread in Southeast Asia, this species is known to inhabit fields and grasslands, such that individuals concentrate even in small clearings of forest environments (Buzzetti and Devriese 2008, Willemse 2001). This finding represents the first published record of this species from both Johor state and Peninsular Malaysia.

Phlaeoba antennata **Brunner von Wattenwyl, 1893**
Fig. 3A, B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 21h48; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.001, MZUM • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 18 September 2024; 23h16; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.045, MZUM • 1♂; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 19 September 2024; 13h55; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.062, MZUM • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 09h17; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.103, MZUM.

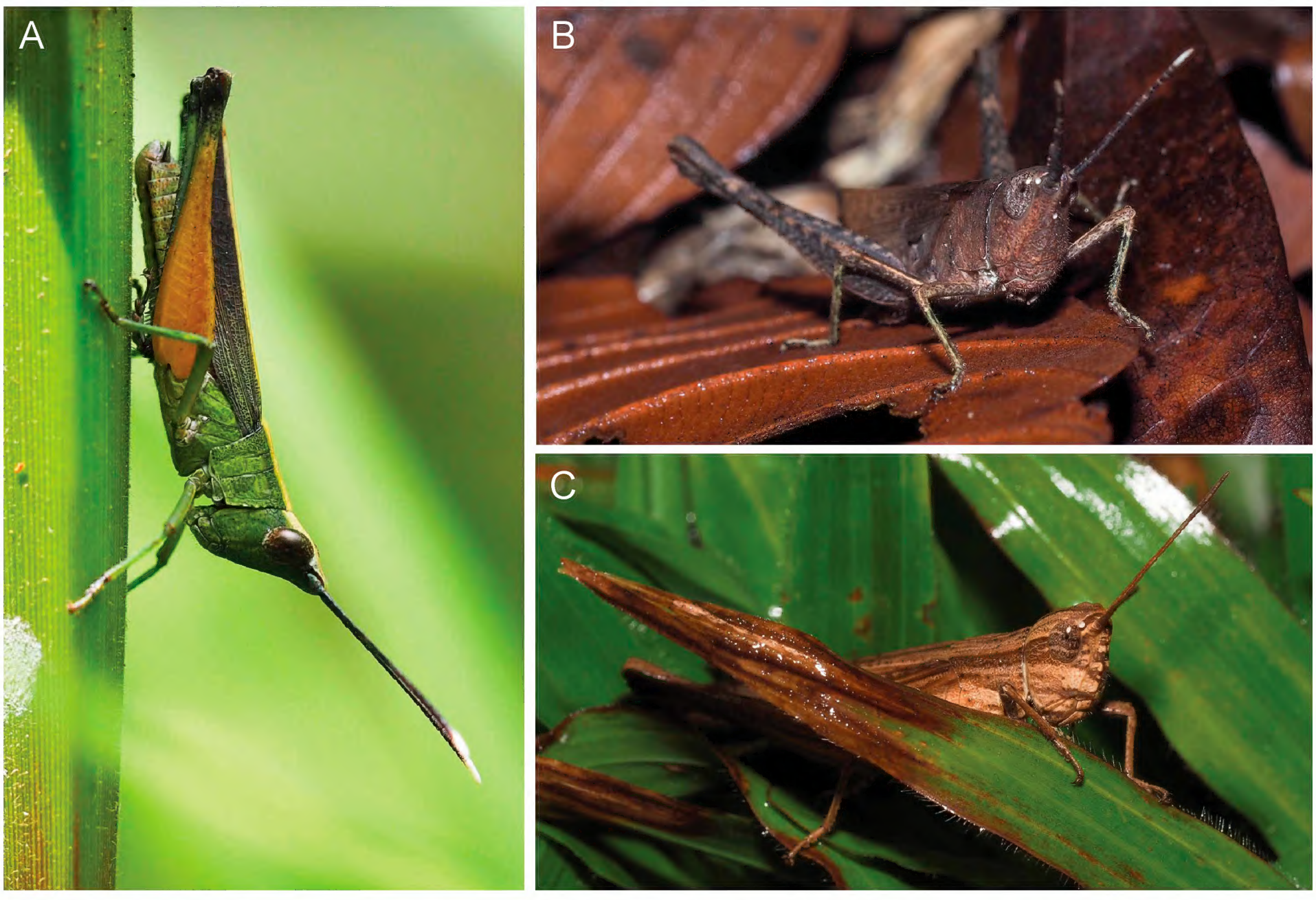

Fig. 3. Acridinae in their natural environment. **A, B.** Male and female adults of *Phlaeoba antennata* Brunner von Wattenwyl, 1893. **C.** Female adult of *Phlaeoba infumata* Brunner von Wattenwyl, 1893.

Remarks.—This is one of the two commonly occurring *Phlaeoba* species that can be found in grassy areas and understory plants. The species is easily recognized by the white tips on the antennae, although male and female habitus differs slightly by the abdominal apex (the female epiproct is more truncated) and color (males are more vibrant, females are brown with the presence of two longitudinal, darkened stripes across the head and pronotal lateral lobes) (Tan and Kamaruddin 2014). Although there are two subspecies—*Phlaeoba antennata antennata* Brunner von Wattenwyl, 1893 and *Phlaeoba antennata malayensis* Bolívar, 1914—we refrain from assigning subspecies status as comparison with type specimens was not made.

Phlaeoba infumata **Brunner von Wattenwyl, 1893**
Fig. 3C

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 21h14; on grass field; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.002, MZUM • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 14h03; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.033, MZUM • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 19 September 2024; 14h41; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.071, MZUM • 1♀; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 10h14; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.099, MZUM.

Remarks.—Similar to *P. antennata*, this species inhabits grassy areas and understory plants. This species differs from *Phlaeoba antennata* in the absence of white tips on the antennae. The male and female habitus also differs slightly by the abdominal apex (the female epiproct is more truncated) and color (males are more vibrant, females are brown with the presence of two longitudinal, darkened stripes across the head and pronotal lateral lobes) (Tan and Kamaruddin 2014).

Subfamily Catantopinae

Sedulia specularia **(Stål, 1875)**
Fig. 4A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba G. Arong; 2.55513°N, 103.75643°E, 67.9±6.6 m.a.s.l.; 11 April 2025, 22h55; on foliage near ground; leg. M. K. Tan & A. A. Muhammad; JHR.25.24, ZRC.

Remarks.—This species was found on the forest floor and can be found throughout the Malay Peninsula (Peninsular Malaysia and Singapore) (Tan et al. 2016). It was identified based on the redescription and key in Tan et al. (2016).

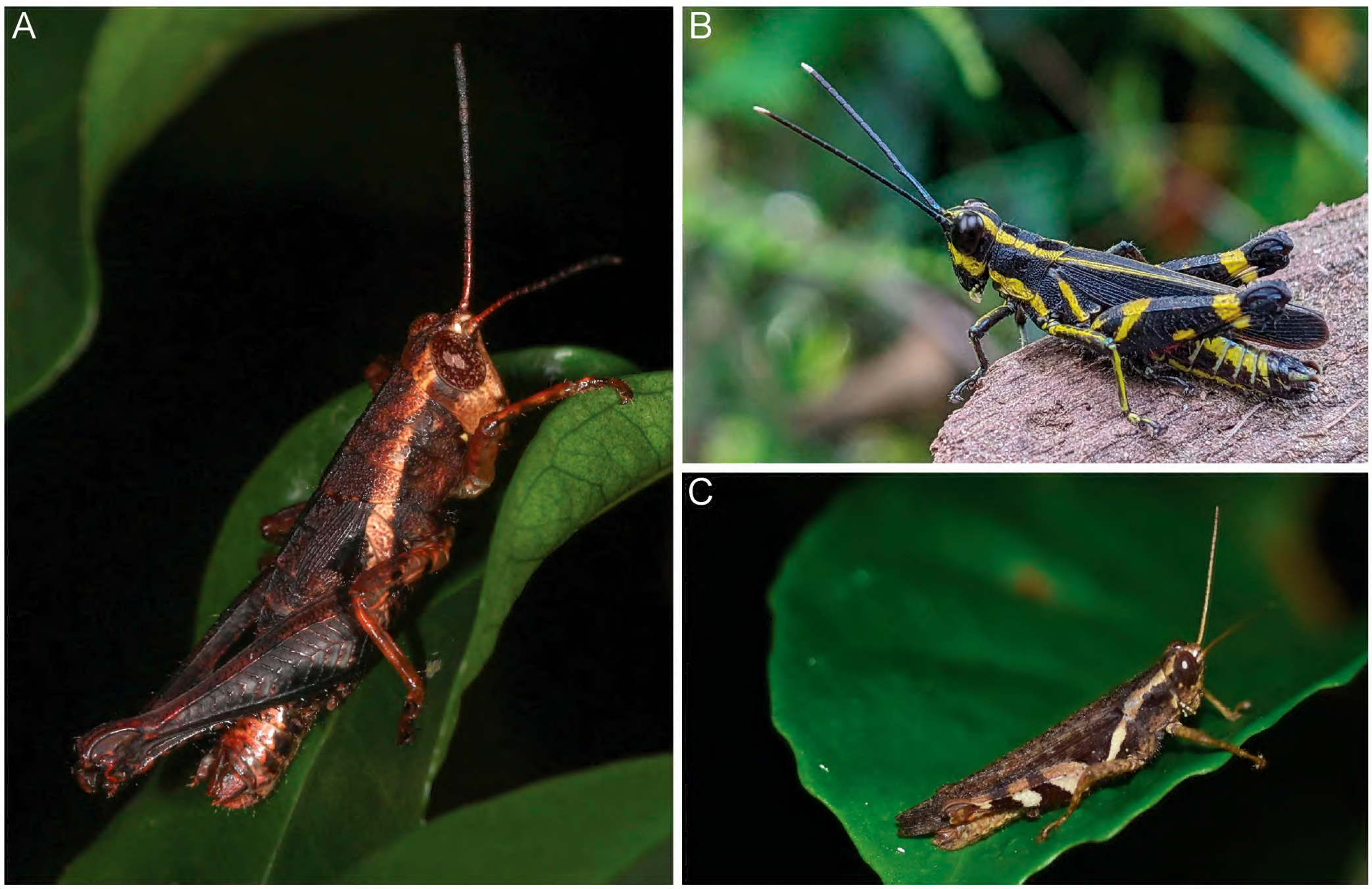

Fig. 4. Catantopinae in their natural environment. **A.** *Sedulia specularia* (Stål, 1875). **B.** *Traulia azureipennis* (Serville, 1838). **C.** *Xenocatantops humilis* (Serville, 1838). Photograph 4B and C by Badrulhadza Amzah, reproduced with his permission.

Traulia azureipennis **(Serville, 1838)**
Fig. 4B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 19 September 2024; 11h38; on leaf litter; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.063, MZUM.

Remarks.—This species was found on the forest floor near the forest edge. The habitus can be distinguished from other grasshoppers by the black coloration, with yellow longitudinal stripes across the body. It was identified based on the description of the color in Willemse (1957) and comparison with type images from OSF (Cigliano et al. 2025).

Xenocatantops humilis **(Serville, 1838)**
Fig. 4C

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 22h15; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.042, MZUM • 1♂; Pantai Teluk Gorek; 2.54058°N, 103.82172°E, 8.5 m.a.s.l.; 19 September 2024; 13h27; on grassy patch under a tree by the beach; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.070, MZUM.

Remarks.—This species was found near the forest floor, such as on foliage of understory plants, and on grassy patches. This species can be distinguished from other grasshoppers by the white longitudinal stripe on both lateral sides of the habitus, from the vertex to the apical margins of hind femora, and distinct stripes on the hind femora.

Subfamily Cyrtacanthacridinae

Valanga nigricornis **(Burmeister, 1838)**
Fig. 5

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Pantai Teluk Gorek; 2.54058°N, 103.82172°E, 8.5 m.a.s.l.; 18 September 2024; 20h58; on a tree branch by the beach; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.037, MZUM.

Remarks.—This species is distinguishable from other grasshoppers by its large size and striking green-yellow coloration. This species was found solitarily and foraging on a tree by the beach.

Subfamily Oedipodinae

Pternoscirta caliginosa **(Haan, 1842)**
Fig. 6A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 19 September 2024; 09h04; on forest floor; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.060, MZUM • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 19 September 2024; 09h11; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.061, MZUM.

Remarks.—This species was found on the forest floor and on the foliage of understory plants along the forest trail. This species is characterized by a scabrous head and pronotum with dense short carinae and tubercles and villous ventral surface and legs (Huang et al. 2013). Apart from those characters, this species is distinguished by greyish-brown coloration and apical half of hind tibia blue. This finding represents the first official record of this species from Johor state.

Fig. 5. *Valanga nigricornis* (Burmeister, 1838) in its natural environment.

Trilophidia annulata **(Thunberg, 1815)**
Fig. 6B, C

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 2♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 23h02; on grassy field; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.005, HSGA2024.010, MZUM • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 13h17; on forest floor; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.029, MZUM • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 13h22; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.034, MZUM • 1♂; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 19 September 2024; 08h55; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.064, MZUM • 1♂, 1♀; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 08h48; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.090, HSGA2024.100, MZUM.

Remarks.—Commonly found on the forest floor and on the foliage of understory plants in the forest, this species is characterized by grey-brown coloration, deep transverse sulci along the dorsal plate of the pronotum, and distinctively black and white-banded hind tibiae (Tan and Kamaruddin 2014).

Subfamily Oxyinae

Gesonula mundata **(Walker, 1870)**
Fig. 7A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 21h18; on

Fig. 6. Oedipodinae in their natural environment. **A.** *Ptenoscirta caliginosa* (Haan, 1842). **B, C.** Male adult and nymph of *Trilophidia annulata* (Thunberg, 1815).

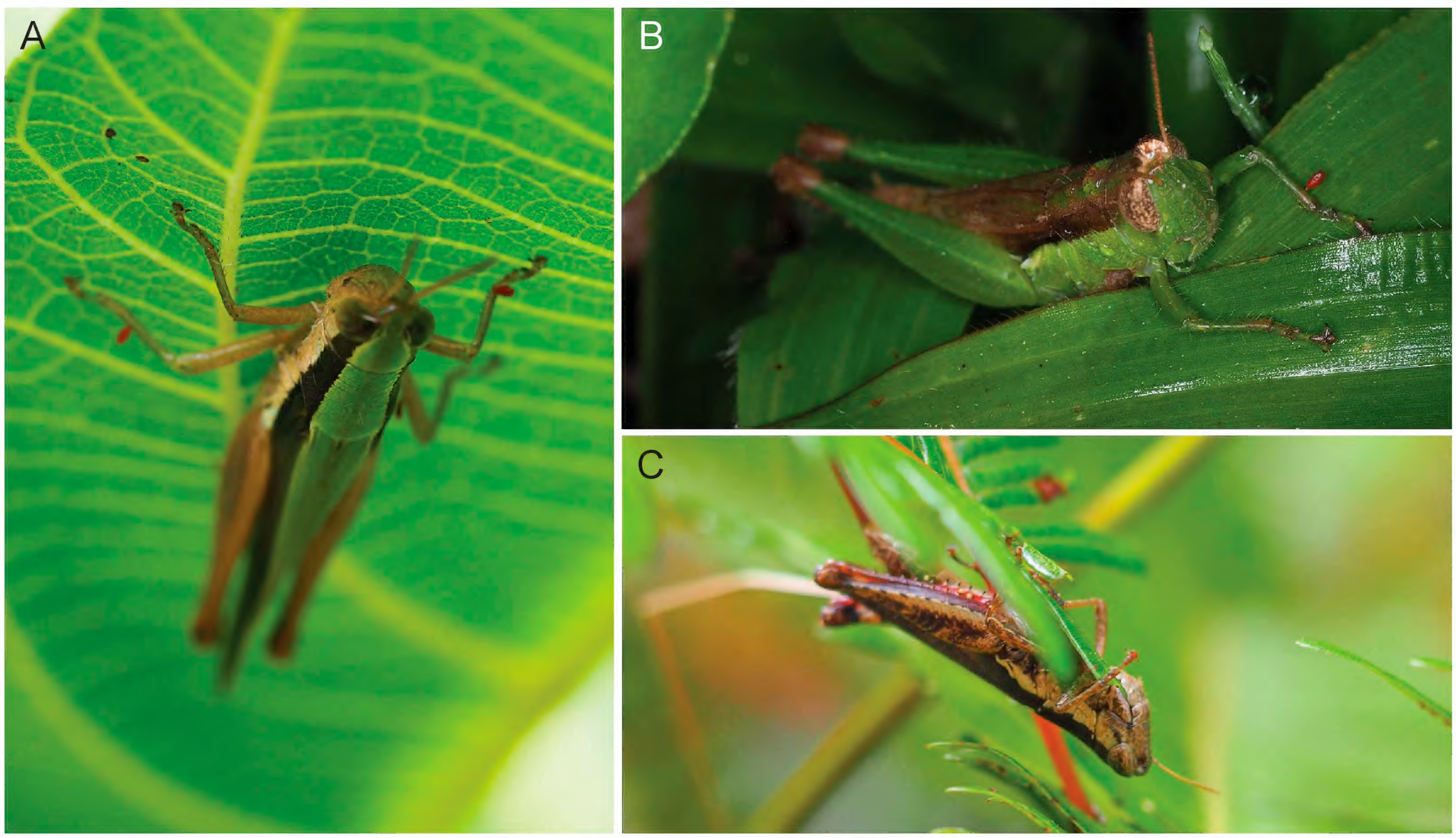

Fig. 7. Oxyinae in their natural environment. **A.** *Gesonula mundata* (Walker, 1870). **B.** *Oxya japonica japonica* (Thunberg, 1824). **C.** *Pseudoxya diminuta* (Walker, 1871).

grassy field; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.007, MZUM • 1♂, 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 13h44; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.030, HSGA2024.031, MZUM.

Remarks.—Characterized by black apex of hind femur and bright-red basal part of hind tibia, this species was found in grassy fields and on the foliage of understory plants in the forest edge. The specimens were identified based on comparison of images from Tan (2012) and with type images from OSF (Cigliano et al. 2025).

Oxya japonica japonica **(Thunberg, 1824)**
Fig. 7B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 19 September 2024;13h58; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.129, MZUM.

Remarks.—This genus may be easily differentiated from the closely related *Pseudoxya* by the longer wings reaching and surpassing the abdominal apex and by blue hind tibiae (versus bright red in those of *Pseudoxya*) (Tan and Kamaruddin 2014). Widely distributed across Asia (Cigliano et al. 2025, Hollis 1971), this grasshopper is also known as the rice grasshopper because of its ability to utilize its laminated hind tibiae to navigate through shallow pools in rice paddy fields (Willemse 2001).

Pseudoxya diminuta **(Walker, 1871)**
Fig. 7C

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 21h48; on grass field; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.004, MZUM • 1♀; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; 10h32; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.057, MZUM • 1♀; Trail 8; 2.55636°N, 103.74748°E, 28.2 m.a.s.l.; 20 September 2024; 13h54; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.108, MZUM.

Remarks.—Characterized by the bright red hind tibia, this common grasshopper can be found on grass, the foliage of understory plants, and in shrubby areas. This species is widely distributed throughout Peninsular Malaysia, Singapore and other parts of Southeast Asia (Willemse 1930, Tan 2012).

Family Pyrgomorphidae
Subfamily Pyrgomorphinae

Tagasta marginella **(Thunberg, 1815)**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.553754°N, 103.755178°E, 41.0 m.a.s.l.; 19 September 2024; 14h03; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.069, MZUM.

Fig. 8. *Potua coronata* Bolívar, 1887 in its natural environment.

Remarks.—This species is distinguished by other Pyrgomorphidae members by shorter and stouter green body, blue hind tibia, and two black spots on the anterior part of forewings. In addition to grassy areas and roadsides (Tan and Kamaruddin 2016a), this species can be found on the foliage of understory plants along the forest edges. This species is widely distributed throughout Southeast Asia (Cigliano et al. 2025).

Family Tetrigidae
Subfamily Cladonotinae

Potua coronata **Bolívar, 1887**
Fig. 8

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Ulu Sungai Pucong Trail (Trail 3); 2.56599°N, 103.80106°E, 87.1±11.3 m.a.s.l; 12 April 2025; 22h09; on dead branch near stream; leg. M. K. Tan, A. A. Muhammad; ZRC_ENT00075616, ZRC • 4♂, 1♀; freshwater swamp trail; 2.554398°N, 103.764149°E, 31.8 m.a.s.l.; 14 April 2025; 21h03; on tree trunk; leg. M. K. Tan, A. A. Muhammad; HSGA2025.024, MZUM; HSGA2025.024, MZUM; HSGA2025.024, MZUM; ZRC_ENT00075615, ZRC; ZRC_ENT00075617, ZRC.

Remarks.—This cryptic species can be easily distinguished by its stout and rugose habitus. From a lateral view, the anterior region of the pronotum is irregularly raised but the posterior region is irregularly rugose (Tumbrinck 2014). Although there are two subspecies of *P. coronata* (*P. coronata coronata* Bolívar, 1887, and *P. coronata sumatrensis* Bolívar, 1898), we refrain from assigning subspecies status to these specimens due to taxonomic complexity (Neo et al. 2024, Tumbrinck 2014). This species was found on dead branches near the stream and gregariously on a tree trunk. It has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Muhammad and Abdullah 2025).

Subfamily Metrodorinae

Systolederus cinereus **Brunner von Wattenwyl, 1893**
Fig. 9A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.553754°N, 103.755178°E, 41.0 m.a.s.l.; 11 April 2025;

19h59; on foliage by the river; leg. A. A. Muhammad, M. K. Tan; ZRC_ENT00075681, ZRC.

Remarks.—This species is characterized by light brown or greyish coloration that may appear uniformed or lightly patterned and by eyes situated close together to form an extremely narrow vertex. This pygmy grasshopper was found on the foliage of an understory plant by the river. Widespread in mainland Southeast Asia, it has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Cigliano et al. 2025, Muhammad and Abdullah 2025).

Xistrella dohrni dohrni **Günther, 1939**
Fig. 9B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.553754°N, 103.755178°E, 41.0 m.a.s.l.; 17 September 2024; 23h14; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.014, MZUM.

Remarks.—This species is characterized by greyish or brown coloration and pronotum that extends beyond hind femora but not beyond hindwings. In frontal view, the fastigial horns are strongly curved and vertex narrow. Commonly found on the foliage of understory plants and by the stream, this species is forest-restricted (Rahim et al. 2024).

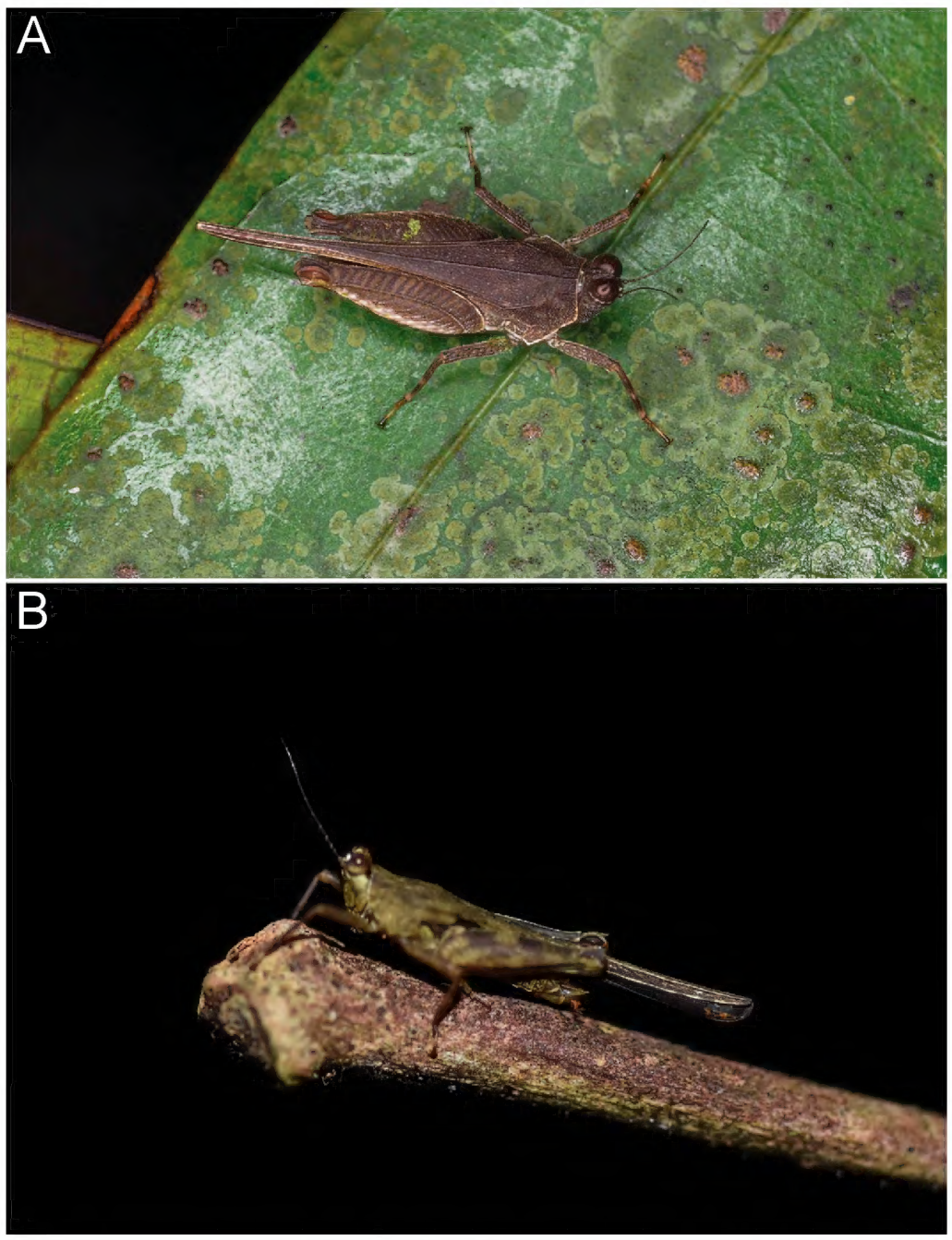

Fig. 9. Metrodorinae in their natural environment. **A.** *Systolederus cinereus* Brunner von Wattenwyl, 1893. **B.** *Xistrella dohrni dohrni* Günther, 1939. Photograph 9B by Badrulhadza Amzah, reproduced with his permission.

Fig. 10. *Falconius bedoti* (Bolívar, 1909) in its natural environment.

Subfamily Scelimeninae

Falconius bedoti **(Bolívar, 1909)**
Fig. 10

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 4♂, 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.553754°N, 103.755178°E, 41.0 m.a.s.l.; 11 April 2025; 19h57; on foliage and concrete structure by the stream; leg. A. A. Muhammad, M. K. Tan; ZRC_ENT00075662, ZRC; HSGA2025.003, MZUM; HSGA2025.004, MZUM; HSGA2025.005, MZUM; ZRC_ENT00075663, ZRC.

Remarks.—This species is characterized by the vertex wider than width of one eye in frontal view, pronotum gibbous from lateral view, and fore femur with undulating dorsal margin and teeth on the ventral margin (Adžić 2021). This species is forest-restricted and can be found near the proximity of flowing streams (Rahim et al. 2024).

Subfamily Tetriginae

Lamellitettigodes contractus **(Bolívar, 1887)**
Fig. 11A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 3♀; Trail 10; 2.53567°N, 103.77581°E, 17.6 m.a.s.l.; 19 September 2024; 21h54; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.073, HSGA2024.078, HSGA2024.091, MZUM.

Remarks.—This species is generally greenish grey, with two black spots on dorsal sides of pronotum and pronotum flat without elevation of median carina (Adžić 2021). Unlike *L. sagittatus*, the distance between the upper margin of the paired ocelli and frontal margin of fastigium than the median ocellus diameter in anterior view is drastically larger (Neo et al. 2024). Our specimen was collected on the foliage of understory plants, though this species can also be found on mossy rocks near rivers or streams (Muhammad et al. 2025).

Lamellitettigodes sagittatus **(Bolívar, 1887)**
Fig. 11B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 13h03; on rotten log; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.032, MZUM

Fig. 11. Tetriginae in their natural environment. **A.** *Lamellitettigodes contractus* (Bolívar, 1887). **B.** *Lamellitettigodes sagittatus* (Bolívar, 1887).

• 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.553754°N, 103.755178°E, 41.0 m.a.s.l.; 19 September 2024; 13h13; on rotten log; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.067, MZUM.

Remarks.—This species is generally brown, with the pronotum extending beyond hind femora but not beyond hindwings. Unlike *L. contractus*, its pronotum is undulated due to the elevated median carina (Adžić 2021). This species can be found on rotten logs and the foliage of understory plants.

Tribe Criotettigini

Criotettix saginatus **Bolívar, 1887**
Fig. 12

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 12h04; on forest floor; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.106, MZUM • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56739°N, 103.80156°E, 10.2 m.a.s.l.; 12 April 2025; 09h18; on concrete pathway; leg. A. A. Muhammad, M. K. Tan; ZRC_ENT00075664, ZRC • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56739°N, 103.80156°E, 10.2 m.a.s.l.; 12 April 2025; 09h19; on concrete pathway; leg. A. A. Muhammad, M. K. Tan; ZRC_ENT00075665, ZRC • 1♀; Gunung Arong Peak Trail (Trail 2); 2.56739°N, 103.80156°E, 10.2 m.a.s.l.; 12 April 2025; 09h21; on concrete pathway; leg. A. A. Muhammad, M. K. Tan; ZRC_ENT00075666, ZRC.

Remarks.—This species is distinguished by having a long pronotum that surpasses the hind femur and spines of the lateral lobes of pronotum that extend away from the body and slightly turned backward (Adžić 2021). This species closely resembles *Criotettix bispinosus* (Dalman, 1818) except for the yellow-brown-colored face in our species (red in living specimens of *C. bispinosus*). Like its congeners, this species can be found near rivers in the forest. Having previously been described from Java, this finding represents the first published record of this species from both Johor state and Peninsular Malaysia.

Tribe Thoradontini

Loxilobus insidiosus **(Bolívar, 1887)**
Fig. 13A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 19 September 2024; 09h42; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.068, MZUM.

Fig. 12. *Criotettix saginatus* Bolívar, 1887 in its natural environment.

Remarks.—This species is notable for having a yellow spot on the tegmen, as described by Adžić (2021). Apart from the aforementioned yellow spot, this species is superficially similar to *T. nodulosa* but can be distinguished by its pronotum slightly more elongated and less rugose in lateral view (Neo et al. 2024). The preferred microhabitats for this forest-restricted species include leaf litter, base of tree trunks, and foliage of understory plants (Muhammad et al. 2025, Neo et al. 2024, Rahim et al. 2024).

Thoradonta nodulosa **(Stål, 1861)**
Fig. 13B

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 10h55; on tree bark; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.105, MZUM.

Remarks.—This species can be recognized by its stout body and distinctly undulated pronotum (Neo et al. 2024). From the anterior view, fastigial horn width is larger than the width of one eye, and the pronotum is no longer than the apex of hind tibia. The specimen was collected at the base of the tree bark and is commonly found on grassy patches and rotten logs as well (Adžić 2021, Muhammad and Abdullah 2025). This species has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Muhammad and Abdullah 2025).

Unassigned Subfamily/Tribe

Coptotettix **sp.**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; 09h24; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.059, MZUM • 1♀; Trail 10; 2.53567°N, 103.77581°E, 17.6 m.a.s.l.; 19 September 2024; 22h13; on forest floor; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.077, MZUM • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 09h20; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.104, MZUM.

Remarks.—Members of the genus *Coptotettix* are difficult to identify and attribute to known species owing to the lack of reliable characters (Adžić 2021, Muhammad AA and Tan MK pers. obs.); hence, we refrained from assigning species status to our specimens. The specimens were found near the forest floor, especially on leaf litter and the foliage of understory plants. This genus is widespread across Asia, including Peninsular Malaysia (Cigliano et al. 2025).

Suborder Ensifera
Family Gryllacrididae
Subfamily Gryllacridinae

Larnaca (*Larnaca*) *fasciata* **Walker, 1869**
Fig. 14

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; 21h41; on tree branch; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.088, MZUM.

Remarks.—This species, with short, banded tegmina, is mostly orange with faint tint of black across its body. Black rings are less prominent on legs, with the femur having a single ring distinct on ventral surface but indistinct on dorsal surface and tibia with two faint rings, distal ring fainter (Tan and Kamaruddin 2014). Our specimen was found high up on a tree branch.

Family Gryllidae
Subfamily Eneopterinae

Cardiodactylus reticulatus **Gorochov, 2014 or**
singapura **Robillard, 2011**
Fig. 15

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba G. Arong; 2.55513°N, 103.75646°E, 65.9±6.6 m.a.s.l.; 11 April 2025, 22h01; resting of foliage; leg. M. K. Tan & A. A. Muhammad; JHR.25.23, ZRC • 1♂; stream at Gunung Arong Recreational Forest (Trail 3); 2.56639°N, 103.80104°E, 103±8.9 m.a.s.l.; 12 April 2025, 21h32; on shrub near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.34, ZRC.

Remarks.—*Cardiodactylus reticulatus* Gorochov, 2014 was described from Pulau Tioman not too far from Mersing, whereas *Cardiodactylus singapura* Robillard, 2011 was described from Singapore. Our specimens did not show clear-cut morphological differences from both species. Based on geographical distance, our specimen is more likely to be *C. reticulatus*.

Fig. 13. Thoradontini in their natural environment. **A.** *Loxilobus insidiosus* (Bolívar, 1887). **B.** *Thoradonta nodulosa* (Stål, 1861).

Lebinthus luae **Robillard & Tan, 2013**
Fig. 16

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 11h44; on leaf litter; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.102, MZUM.

Remarks.—This species is characterized by having dark-brown body, yellowish-white longitudinal bands along its body, and short forewings that do not surpass the abdomen mid-length. A diurnal species, it can be found calling and mating—often in high density—on leaf litter (Robillard and Tan 2013). This is a widespread species from Singapore to the Philippines and can be found near coastal forests. It is therefore not surprising that it is also found in the coastal forests of Gunung Arong.

Nisitrus malaya **Robillard & Tan, 2021**
Fig. 17

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Empangan Chongok (Trail 14); 2.50225°N, 103.78770°E, 26.0 m.a.s.l.; 18 September 2024; 14h54; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.028, MZUM • 1♂; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; 09h09; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.052, MZUM.

Fig. 14. *Larnaca* (*Larnaca*) *fasciata* Walker, 1869 in its natural environment.

Remarks.—This species is another diurnal cricket that is found among foliage in the understory and distinguished from other crickets by the distinct color patterns (Tan et al. 2021b). This species is one of the most common crickets in Peninsular Malaysia even though it is underreported (Muhammad AA pers. obs.).

Subfamily Gryllinae

Agryllus **or** *Acanthoplistus* **sp.**
Fig. 18

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 3♂, 3♀; Taman Eko Rimba G. Arong; 2.55441°N, 103.75627°E, 54±7.9 m.a.s.l.; 11 April 2025, 20h57; leaf litter; leg. M. K. Tan & A. A. Muhammad; JHR.25.13–18, ZRC • 1♀; Taman Eko Rimba G. Arong; 2.55505°N, 103.75655°E, 65.5±8 m.a.s.l.; 11 April 2025, 21h08; leaf litter; leg. M. K. Tan & A. A. Muhammad; JHR.25.19, ZRC.

Remarks.—This species is characterized by thick antennae with white band, pronotum punctuated, forewings scale-like. Numerous individuals can be found close to one another among leaf litter in the forest. The male genitalia of our specimens resemble those of *Agryllus*, but the habitus somewhat resembles those of some species of *Acanthoplistus*. At present, we cannot confirm the name of this cricket.

Loxoblemmus (*Loxoblemmus*) *parabolicus* **Saussure, 1877**
Fig. 19

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 21h05; on rotten bark; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.115, MZUM.

Remarks.—A relatively small cricket, this species is characterized by the brown to black coloration and fastigium protruded forward to form an acute edge from lateral view. This ground-dwelling cricket was collected on a rotten bark by the river and can also be found among short grasses along forest edges (Tan 2017). Previously recorded from Singapore, Indonesia (Java), and Vietnam (Cigliano et al. 2025), it is not surprising that this species is found in Peninsular Malaysia.

Fig. 15. *Cardiodactylus reticulatus* Gorochov, 2014 or *singapura* Robillard, 2011. **A.** Male adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

Teleogryllus (*Macroteleogryllus*) *derelictus* **Gorochov, 1985**
Fig. 20A–C

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 23h07; on grass; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.016, MZUM.

Remarks.—Apart from having a vertex light colored, this species is larger than *Teleogryllus* (*Macroteleogryllus*) *mitratus*. For the male genitalia, the pseudepiphallus [= epiphallus] is strongly curved, with a narrow and short median lobe and the anterior margin relatively acute (Lu et al. 2018). This finding represents the first published record of this species from both Johor state and Peninsular Malaysia outside of its type locality in Vietnam (Gorochov 1985).

Teleogryllus (*Macroteleogryllus*) *mitratus* **(Burmeister, 1838)**
Fig. 20D–F

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂, 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 23h03; on grass; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.017, HSGA2024.019, MZUM.

Remarks.—This species is smaller than *T.* (*M.*) *derelictus*. Unlike *T.* (*M.*) *derelictus*, this species has a dark-brown head with a thin stripe above its eyes (Lu et al. 2018). For the male genitalia, the pseudepiphallus [= epiphallus] is strong curved, with median lobe narrower and long and the anterior margin more acute than the preceding species (Lu et al. 2018). This is a very common and widespread species in Southeast Asia (Cigliano et al. 2025).

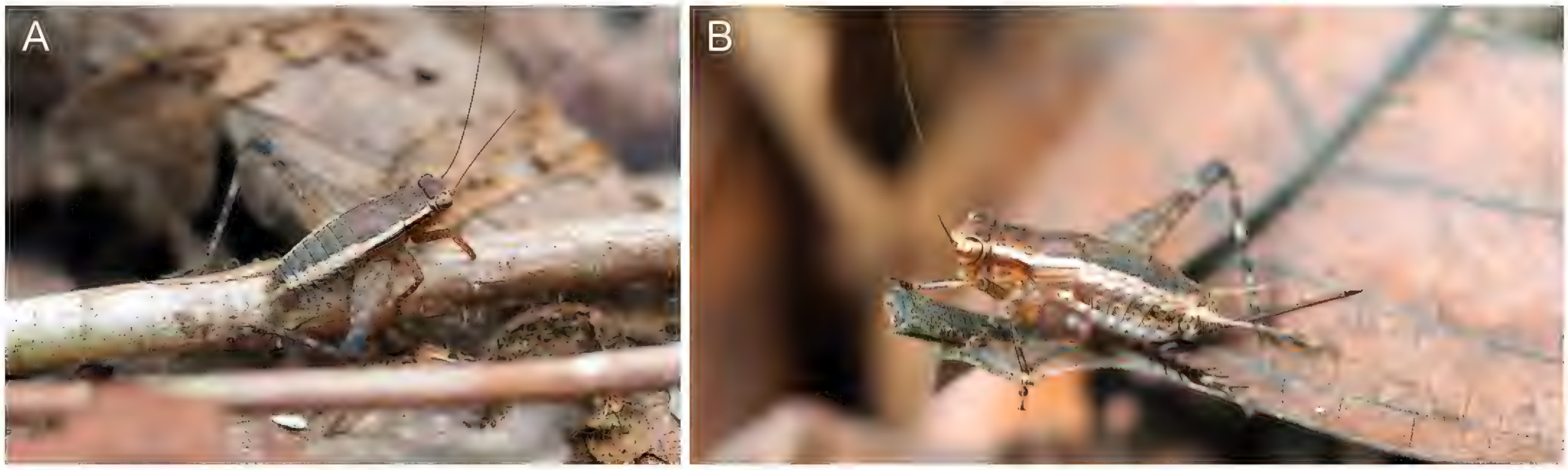

Fig. 16. *Lebinthus luae* Robillard & Tan, 2013. **A, B.** Male and female in their natural environment.

Fig. 17. *Nisitrus malaya* Robillard & Tan, 2021. **A–C.** Male and female adults, nymph in their natural environment.

Fig. 18. *Agryllus* or *Acanthoplistus* sp. **A, B.** Male and female adults in their natural environment. **C–E.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

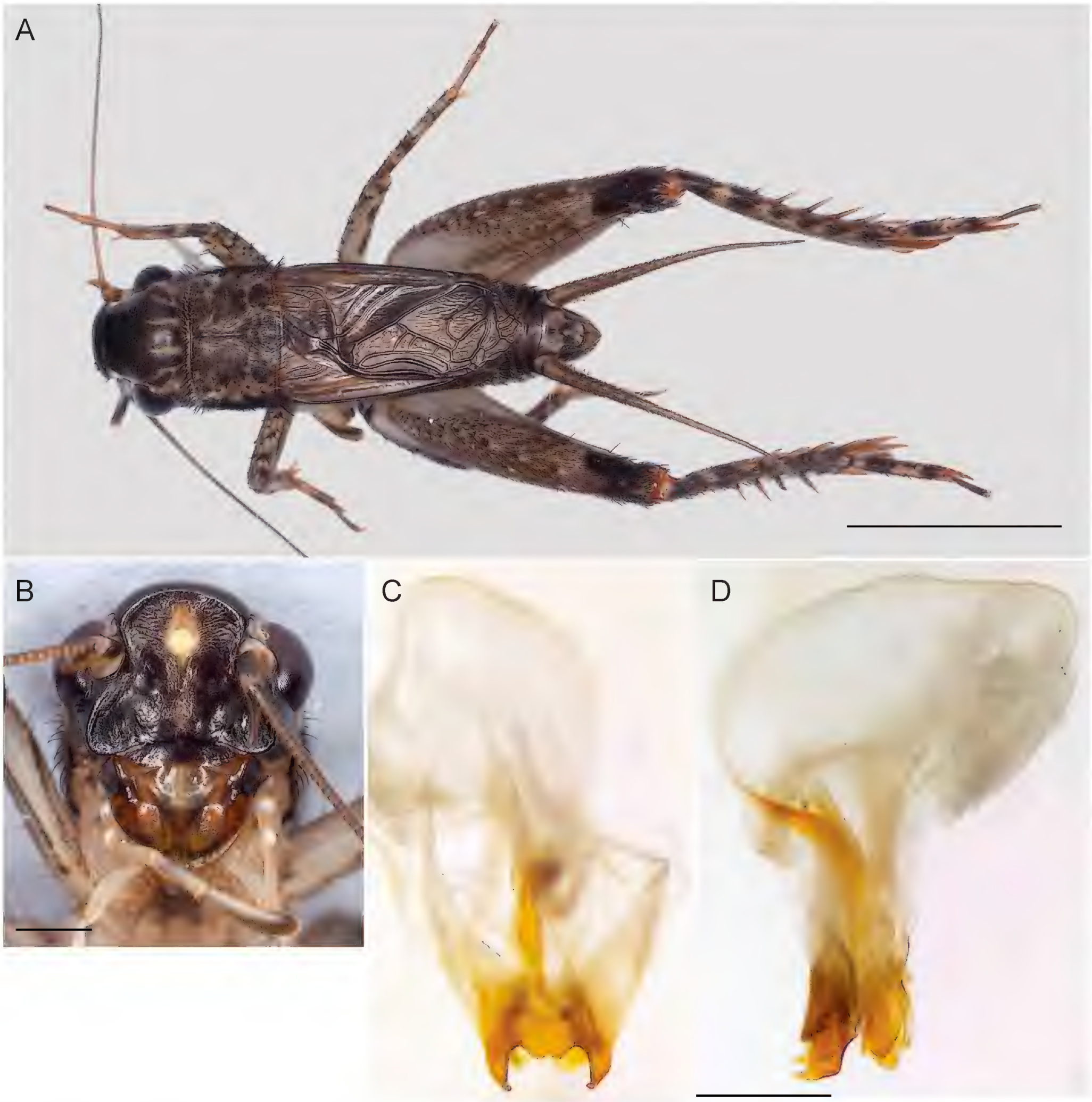

Fig. 19. *Loxoblemmus* (*Loxoblemmus*) *parabolicus* Saussure, 1877. **A.** Male habitus in dorsal view. **B.** Head of male in frontal view. **C, D.** Male genitalia in dorsal and lateral views. Scale bars: 5 mm (**A**), 1 mm (**B**), 0.5 mm (**C, D**).

Velarifictorus (*Velarifictorus*) *aspersus* **(Walker, 1869)**
Fig. 21

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Gunung Arong Peak Trail (Trail 2); 2.56767°N, 103.80161°E, 27.8 m.a.s.l.; 20 September 2024; 09h24; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.096, MZUM • 1♂, 1♀; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 22h09; on leaf litter; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.117, HSGA2024.121, MZUM • 1♂; Trail 4; 2.568374°N, 103.814724°E, 7.2 m.a.s.l.; 10 April 2025; 20h34; on leaf litter; leg. A. A. Muhammad, M. K. Tan; HSGA2025.001, MZUM.

Remarks.—This species is characterized by dull-brown coloration, distinct band between the lateral ocelli not connected to the white spot around the median ocellus, and forewings extending until two-thirds of abdomen. This common cricket was found on leaf litter and foliage of understory plants, apart from along forest edges and roadsides (Tan and Kamaruddin 2016a). This is a very common and widespread species in Southeast Asia (Cigliano et al. 2025).

Fig. 20. A. *Teleogryllus* (*Macroteleogryllus*) *derelictus* Gorochov, 1985. **A.** Male in its natural environment. **B, C.** Male genitalia in lateral and ventral views. *Teleogryllus* (*Macroteleogryllus*) *mitratus* (Burmeister, 1838). **D.** Male habitus in dorsal view. **E, F.** Male genitalia in lateral and ventral views. Scale bars: 5 mm (**D**), 1 mm (**B, C, E, F**).

Subfamily Landrevinae

Duolandrevus (*Bejorama*) *firmus tioman* **Gorochov, 2016**
Fig. 22

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 21h58; on fallen tree bark; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.022, MZUM • 1♂, 1♀; stream at Gunung Arong Recreational Forest (Trail 3); 2.56694°N, 103.80104°E, 66.9±6.9 m.a.s.l.; 12 April 2025, 21h07; on dead trunk near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.32, 33, ZRC • 1♂; Gunung Arong Recreational Forest (Trail 2); 13 April 2025; leg. M. K. Tan & A. A. Mu-

Fig. 21. *Velarifictorus* (*Velarifictorus*) *aspersus* (Walker, 1869). **A, B.** Male adults in their natural environment. **C, D.** Female adults in their natural environment.

hammad; JHR.25.52, ZRC • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.55415°N, 103.76553°E, 117.1±7.1 m.a.s.l.; 14 April 2025, 22h24; crevice of dead log; leg. M. K. Tan & A. A. Muhammad; JHR.25.68, ZRC.

Remarks.—This specimen resembles the subspecies from Pulau Tioman more than the nominal subspecies by the wider pseudepiphallic lophi [= posterolateral epiphallic lobes] (in profile) and the distal part of the pseudepiphallic parameres [= ectoparameres] distinctly hooked and not surpassing the pseudepiphallic lophi. Found on a fallen tree bark, this species can be heard calling under the bark or inside the bark's holes and crevices (Tan et al. 2024d). Apart from this study and its type locality (Pulau Tioman, Pahang), this species has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024d).

Odontogryllodes undatus **Tan, Muhammad & Abdullah, 2024**
Fig. 23

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba G. Arong; 2.55513°N, 103.75643°E, 67.9±6.6 m.a.s.l.; 11 April 2025, 22h55; on dead branch; leg. M. K. Tan & A. A. Muhammad; JHR.25.25, ZRC • 1♂; Taman Eko Rimba G. Arong; 2.5551°N, 103.75655°E, 66.7±6.3 m.a.s.l.; 11 April 2025, 21h55; on branch of small tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.22, ZRC.

Remarks.—A recently described species known only from Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024a), this represents the first record of this species outside its type locality.

Family Mogoplistidae
Subfamily Mogoplistinae

Ectatoderus angusticollis **Chopard, 1969**
Fig. 24

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 22h12; on tree branch; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.008, MZUM • 1♂; Taman Eko Rimba G. Arong; 2.55505°N, 103.75655°E, 65.5±8 m.a.s.l.; 11 April 2025, 21h08; leg. M. K. Tan & A. A. Muhammad; JHR.25.21, ZRC.

Fig. 22. *Duolandrevus* (*Bejorama*) *firmus tioman* Gorochov, 2016. **A.** Male adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

Remarks.—This species is characterized by the pronotum produced strongly posteriorly covering most of forewings and the male genitalia spiraling basally (Tan et al. 2022). This species was described and known so far only in Singapore (Chopard 1969; Tan et al. 2022). The specimens from Gunung Arong represent the first record of this species outside Singapore.

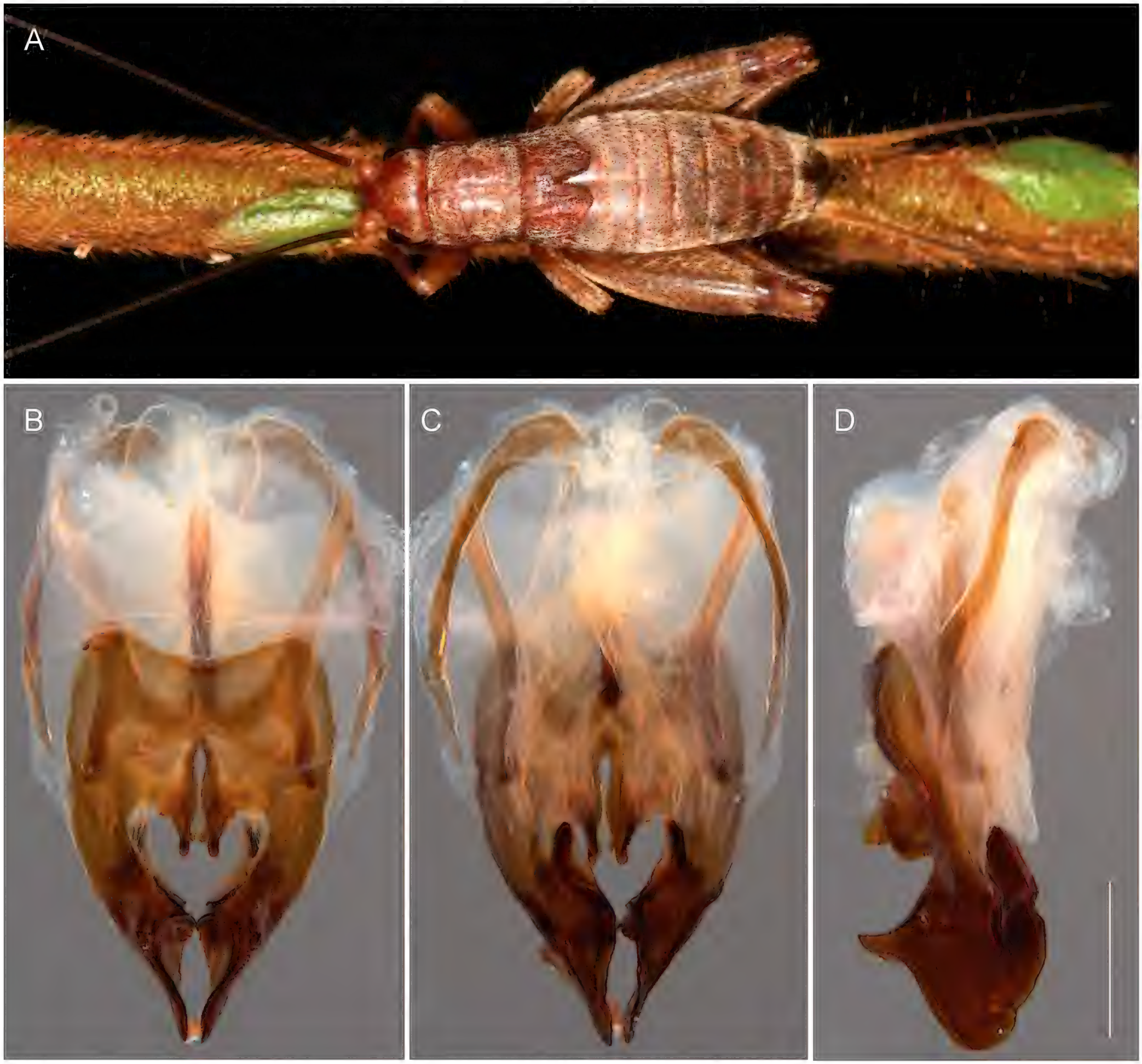

Fig. 23. *Odontogryllodes undatus* Tan, Muhammad & Abdullah, 2024. **A.** Male adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

Micrornebius **sp.**
Fig. 25

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂, 1♀; Gunung Arong Recreational Forest (Trail 2); 2.56583°N, 103.80273°E, 122.3±5.5 m.a.s.l.; 13 April 2025, 21h58; on tree bark; leg. M. K. Tan & A. A. Muhammad; JHR.25.50, 51, ZRC.

Remarks.—This cryptic species was collected from tree bark, where species of the genus tend to be found (Tan 2014a). The species from Gunung Arong also differs from the congeners from Singapore (Tan 2014a) and Peninsular Malaysia (Tan and Kamaruddin 2013), but more material is needed to confirm the species identity.

Ornebius pullus **Ingrisch, 2006**
Fig. 26A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 21h42; on tree branch; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.043, MZUM • 1♂; Kerangas forest near Tanjung Resang (Trail 4A); 2.56873°N, 103.81404°E, 37.5±6.3 m.a.s.l.; 10 April 2025, 20h35; on foliage of small tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.1, ZRC.

Remarks.—This species has been reported in Singapore and Borneo (Sabah and Brunei Darussalam), but its taxonomy needs further examination (Ingrisch 2006, Tan et al. 2021a, 2022). It is

Fig. 24. *Ectatoderus angusticollis* Chopard, 1969. **A, B.** Male and female in their natural environment. **C.** Male genitalia in lateral view. Scale bar: 0.5 mm.

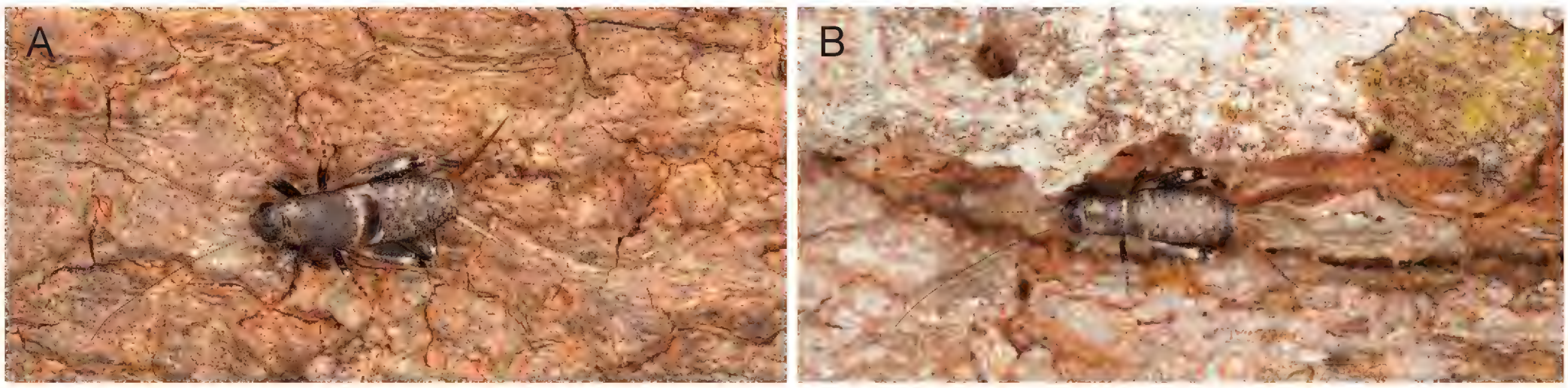

Fig. 25. *Micrornebius* sp. **A, B.** Male and female adults in their natural environment.

plausible that this species is made up of a complex of recently diverged species from different parts of its distribution or of a single widespread species.

Ornebius rufonigrus **Ingrisch, 1987**
Figs 26B, 27A

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Kerangas forest near Tanjung Resang (Trail 4A); 2.56794°N, 103.81366°E, 31.4±7.4 m.a.s.l.; 10 April 2025, 21h20; calling on leaf of free; leg. M. K. Tan & A. A. Muhammad; JHR.25.2, ZRC • 1♂; Kerangas forest near Tanjung Resang (Trail 4A); 2.56786°N, 103.81353°E, 33.8±7.1 m.a.s.l.; 10 April 2025, 21h25; on foliage of tree with female; leg. M. K. Tan & A. A. Muhammad; JHR.25.3, ZRC.

Remarks.—This species was encountered in coastal habitat and has been reported in a similar environment in Singapore (Tan and Ingrisch 2013, Tan 2013). It can be differentiated from other congeners by its orange forewings and larger habitus size. It was

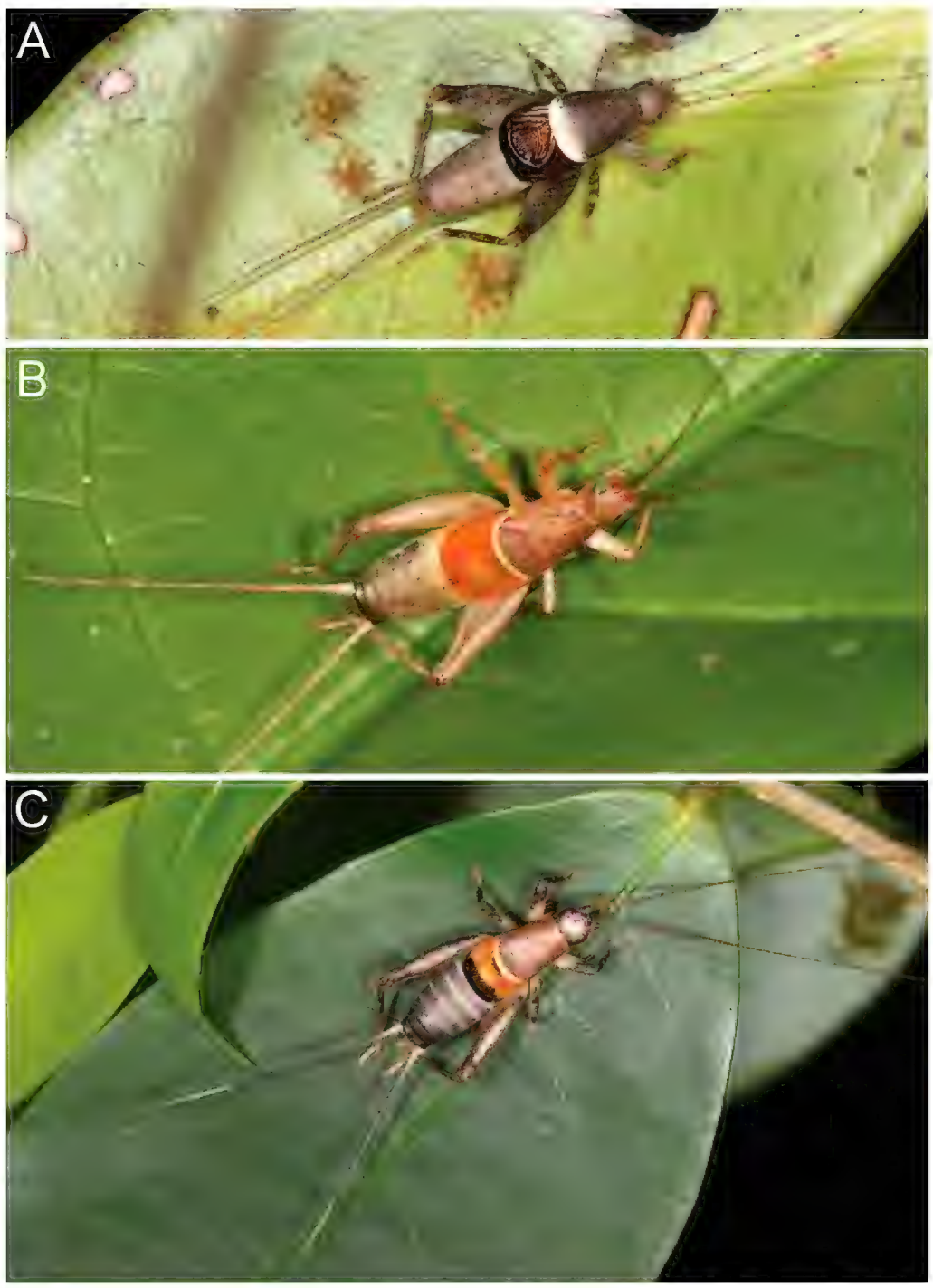

Fig. 26. A. *Ornebius pullus* Ingrisch, 2006 male adult. **B.** *Ornebius rufonigrus* Ingrisch, 1987 male adult. **C.** *Ornebius xinyao* Tan, 2015 male adult.

first described from the coastal habitats of Ko Samui in Thailand) and has since been documented in Singapore and Borneo. It is therefore not surprising that this species can also be found in the coastal habitat in Gunung Arong. This represents the first record of this species in Peninsular Malaysia.

Ornebius xinyao **Tan, 2015**
Figs 26C, 27B–D, 28

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 22h20; on tree branch; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.044, MZUM • 1♂; Gunung Arong Recreational Forest (Trail 2); 2.56669°N, 103.80189°E, 89.1±6.6 m.a.s.l.; 13 April 2025, 21h02; on foliage of tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.42, ZRC • 2♀; Gunung Arong Recreational Forest (Trail 2); 2.56666°N, 103.80196°E, 91.9±7.4 m.a.s.l.; 13 April 2025, 21h11; on dead log near ground; leg. M. K. Tan & A. A. Muhammad; JHR.25.43, 44, ZRC • 1♂; Gunung Arong Recreational Forest (Trail 2); 2.56659°N, 103.80209°E, 94.7±5.5 m.a.s.l.; 13 April 2025, 21h19; fell from tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.45, ZRC • 1♂, 1♀; Gunung Arong Recreational Forest (Trail 2); 2.56643°N, 103.80219°E, 101.7±6.1 m.a.s.l.; 13 April 2025, 21h26; among shrub; leg. M. K. Tan & A. A. Muhammad; JHR.25.47, 48, ZRC.

Remarks.—This species was first described from the coastal forest in northern Singapore (Tan et al. 2015) and has not been recorded since. We collected this species from coastal forests in Gunung Arong, and this represents the first record outside its type locality.

New material from Gunung Arong allowed us to further examine the species, and we found it to be also similar to *Ornebius citrus* Ingrisch, 2006 from Crocker Range (Sabah, Borneo) by the general

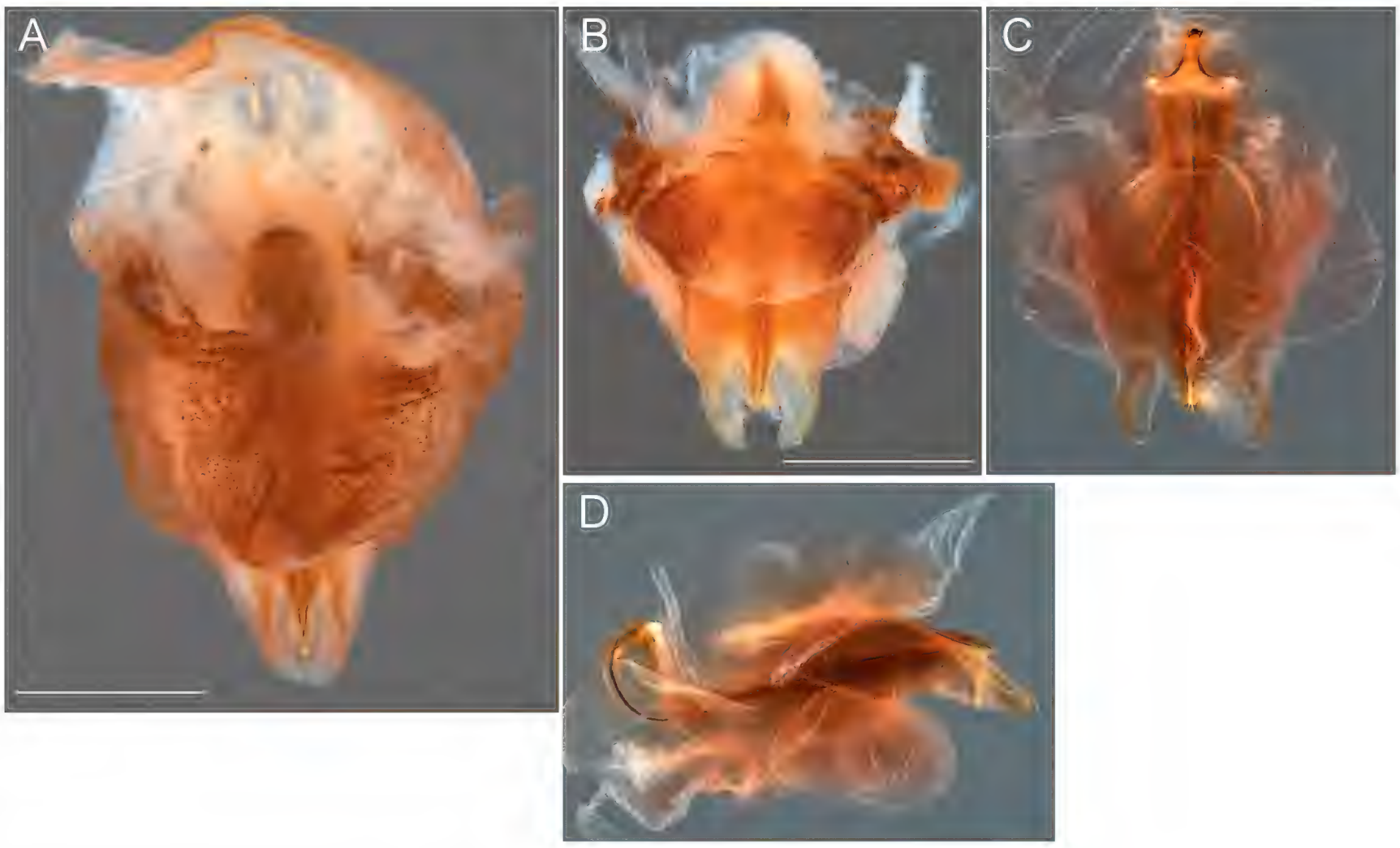

Fig. 27. A. *Ornebius rufonigrus* Ingrisch, 1987 male genitalia before cleaning in dorsal view. **B–D.** *Ornebius xinyao* Tan, 2015 male genitalia in dorsal (before cleaning), ventral, and lateral views. Scale bars: 0.5 mm.

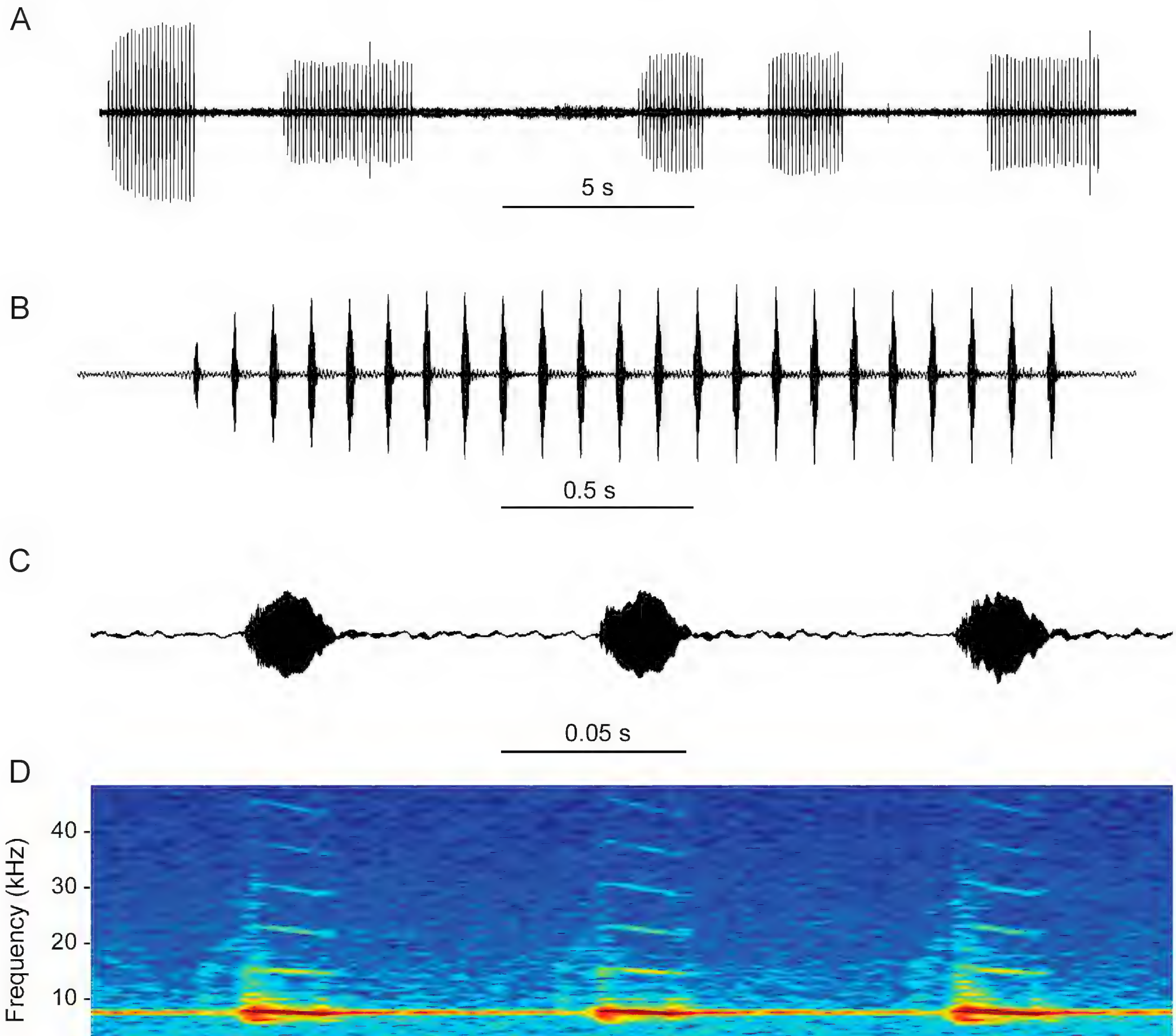

Fig. 28. *Ornebius xinyao* Tan, 2015 male calling songs. **A–C.** Oscillograms of five echemes, one echeme and three syllables. **D.** Spectrogram of the three syllables.

coloration, shapes of maxillary palps, abdominal apex, and male phallic complex; it differs distinctly by the shape and color of the paraprocts (and having two stout setae at the apex), the forewing having a thicker apical black band and having a black spot at the middle (present in all examined specimens), and the lateral valves of the phallic complex slenderer, somewhat sinuous, and consistently more widely spaced apart.

The calling song of *O. xinyao* is also described here for the first time: At 29.7°C, it consists of echemes made up of 21±4 isolated syllables (14–33 syllables) and has an average duration of 1.99±0.46 s (1.21–3.35 s). Within each echeme, the average syllable duration is 25.5±3.2 ms (19.5–33.0 ms), the average silent interval between consecutive syllables is 71.3±7.3 ms (60.8–90.5 ms), and the average syllable period is 96.8±5.9 ms (89.3–112.1 ms). The call spectrum consists of a harmonic series with a peak frequency as the fundamental frequency of 7.66±0.17 kHz (7.41–7.97 kHz) and the second harmonics of a lower energy of 15.20±0.34 kHz (14.72–15.84 kHz).

Family Oecanthidae
Subfamily Oecanthinae

Xabea **sp.**
Fig. 29

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Adinandra belukar in Gunung Arong Recreational Forest (Trail 12); 2.54547°N, 103.76839°E, 36.6±8.6 m.a.s.l.; 12 April 2025, 20h05; under foliage of tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.30, ZRC.

Remarks.—This genus is in need of a taxonomic revision for taxa in Southeast Asia. Until then, it is best to identify our specimen only to the genus level.

Subfamily Podoscirtinae

Aphonoidini sp.
Fig. 30

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; stream at Gunung Arong Recreational Forest (Trail 3); 2.56585°N, 103.80112°E, 83.3±11.6 m.a.s.l.; 12 April 2025, 22h13; on trunk near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.37, ZRC.

Remarks.—Only a female was collected. Without examining the male genitalia, it is not possible to reliably identify the genus and species.

Sonotrella (*Calyptotrella*) *lobata* **(Chopard, 1969)**
Fig. 31

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; on foliage; leg. Daicus M. Belabut; HSGA2024.128, MZUM.

Remarks.—This species is brown in general, with the posterior end of hind femur and anterior part of hind tibia having a tinge of bluish green. The center of the male metanotal gland with presence of distinct transverse membranous projection, the male anal plate with long narrow additional lateral lobules (near bases of cerci), and hooks of inner (distal) membranous lobes strongly reduced (Gorochov 2002). This specimen was collected on the foliage of a tree in the lowland secondary forest at night. Apart from its type locality at "Pulou Jarak" [=Pulau Jarak, Perak state] (Chopard 1969), this finding represents the first official record of this species from Johor state.

Subfamily Euscyrtinae

Euscyrtus concinnus **(Haan, 1844)**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; on foliage; leg. Badrulhadza A., M. Iman Z., M. Akmal Hidayat Z., M. Izzuddin A.; HSGA2024.055, MZUM • 1♀; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; on foliage; leg. Badrulhadza A., M. Iman Z., M. Akmal Hidayat Z., M. Izzuddin A.; HSGA2024.056, MZUM.

Remarks.—This species is uniformly pale brown, body very slender with tegmina extending almost to the apex of abdomen, and head scarcely broader than the pronotum, presenting four very feebly marked broad brown bands (Chopard 1969). The specimen was collected on foliage of understory plants in the lowland secondary forest during daytime.

Family Phalangopsidae
Subfamily Phalangopsinae

Parendacustes (*Parendacustes*) *aduncus* **Tan, Muhammad & Gorochov, 2024**
Fig. 32

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; stream at Gunung Arong Recreational Forest (Trail 3); 2.56575°N, 103.80125°E, 80.4±12 m.a.s.l.; 12 April 2025, 22h18; on trunk near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.38, ZRC • 1♀; Gunung Arong Recreational Forest (Trail 2); 2.56659°N, 103.80209°E, 94.7±5.5 m.a.s.l.; 13 April 2025, 21h19; leaf litter; leg. M. K. Tan & A. A. Muhammad; JHR.25.46, ZRC • 1♀; swamp forest in Gunung Arong Recreational Forest; 2.55469°N, 103.76423°E, 64.3±16.3 m.a.s.l.; 14 April 2025, 21h15; under dead trunk; leg. M. K. Tan & A. A. Muhammad; JHR.25.64, ZRC • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.55483°N, 103.76437°E, 92.9±9.7 m.a.s.l.; 14 April 2025, 20h52; on rotten log; leg. M. K. Tan & A. A. Muhammad; JHR.25.58, ZRC • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.55459°N, 103.76465°E, 68.7±10.4 m.a.s.l.; 14 April 2025, 21h40; on trunk; leg. M. K. Tan & A. A. Muhammad; JHR.25.66, ZRC.

Remarks.—This is a recently described species known only from Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024a). This represents the first record of this species outside its type locality.

Subfamily Phaloriinae

Protrellius helverseni tioman **(Gorochov, 2011)**
Fig. 33

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 2♂; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 21h43; on foliage by the river; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.124, HSGA2024.125, MZUM • 2♂; Taman Eko Rimba G. Arong; 2.55377°N, 103.75613°E, 55.8±5.8 m.a.s.l.; 11

Fig. 29. *Xabea* sp. male adult in its natural environment.

Fig. 30. Aphonoidini sp. female adult in its natural environment.

April 2025, 20h04; calling between foliage near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.10, 11, ZRC • 1♀; stream at Gunung Arong Recreational Forest (Trail 3); 2.56694°N, 103.80104°E, 66.9±6.9 m.a.s.l.; 12 April 2025, 21h07; on foliage near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.31, ZRC • 1♂; stream at Gunung Arong Recreational Forest (Trail 3); 2.56594°N, 103.80107°E, 88.5±16.1 m.a.s.l.; 12 April 2025, 22h02; on foliage of tree along stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.35, ZRC • 1♂; stream at Gunung Arong Recreational Forest (Trail 3); 2.56668°N, 103.80109°E, 56.1±14.5 m.a.s.l.; 14 April 2025, 10h10; under dead long on stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.53, ZRC.

Remarks.—Typical of the genus, these crickets are found close to forest streams and numerous males produce loud echemes at the same time at night. Apart from this study and its type locality (Pulau Tioman, Pahang) (Gorochov 2011a), this species has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024d).

Family Pteroplistidae
Subfamily Pteroplistinae

Pteroplistes **sp.**
Fig. 34

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; swamp forest in Gunung Arong Recreational Forest; 2.55509°N, 103.76385°E, 76.9±9.1 m.a.s.l.; 14 April 2025, 20h02; on tree trunk; leg. M. K. Tan & A. A. Muhammad; JHR.25.56, ZRC.

Remarks.—Only a female was collected, and it is not possible to confirm the species name. In Peninsular Malaysia, *Pteroplistes* (*Pteroplistes*) *acinaceus* Saussure, 1877 and *Pteroplistes* (*Pteroplistes*) *malaccanus* Gorochov, 2018 have been known from Melaka and Pahang, respectively (Cigliano et al. 2025).

Singapuriola separata **Gorochov & Tan, 2012**
Fig. 35

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 21h47; on tree bark; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.116, MZUM • 1♂; Taman Eko Rimba G. Arong; 2.55414°N, 103.756°E, 60.3±7 m.a.s.l.; 11 April 2025, 20h35; walking on dead branch; leg. M. K. Tan & A. A. Muhammad; JHR.25.12, ZRC • 1♂; stream at Gunung Arong Recreational Forest (Trail 3); 12 April 2025; hiding inside rolled dead leaf near stream; leg. M. K. Tan & A. A. Muhammad; JHR.25.39, ZRC • 1♂, 1♀; Gunung Arong Recreational Forest (Trail 2); 2.56675°N, 103.80179°E, 81±6.1 m.a.s.l.; 13 April 2025, 21h02; inside dried curled leaf beside one with calling male; leg. M. K. Tan & A. A. Muhammad; JHR.25.40, 41, ZRC • 1♂; Gunung Arong Recreational Forest (Trail 2); 2.56608°N, 103.80244°E,

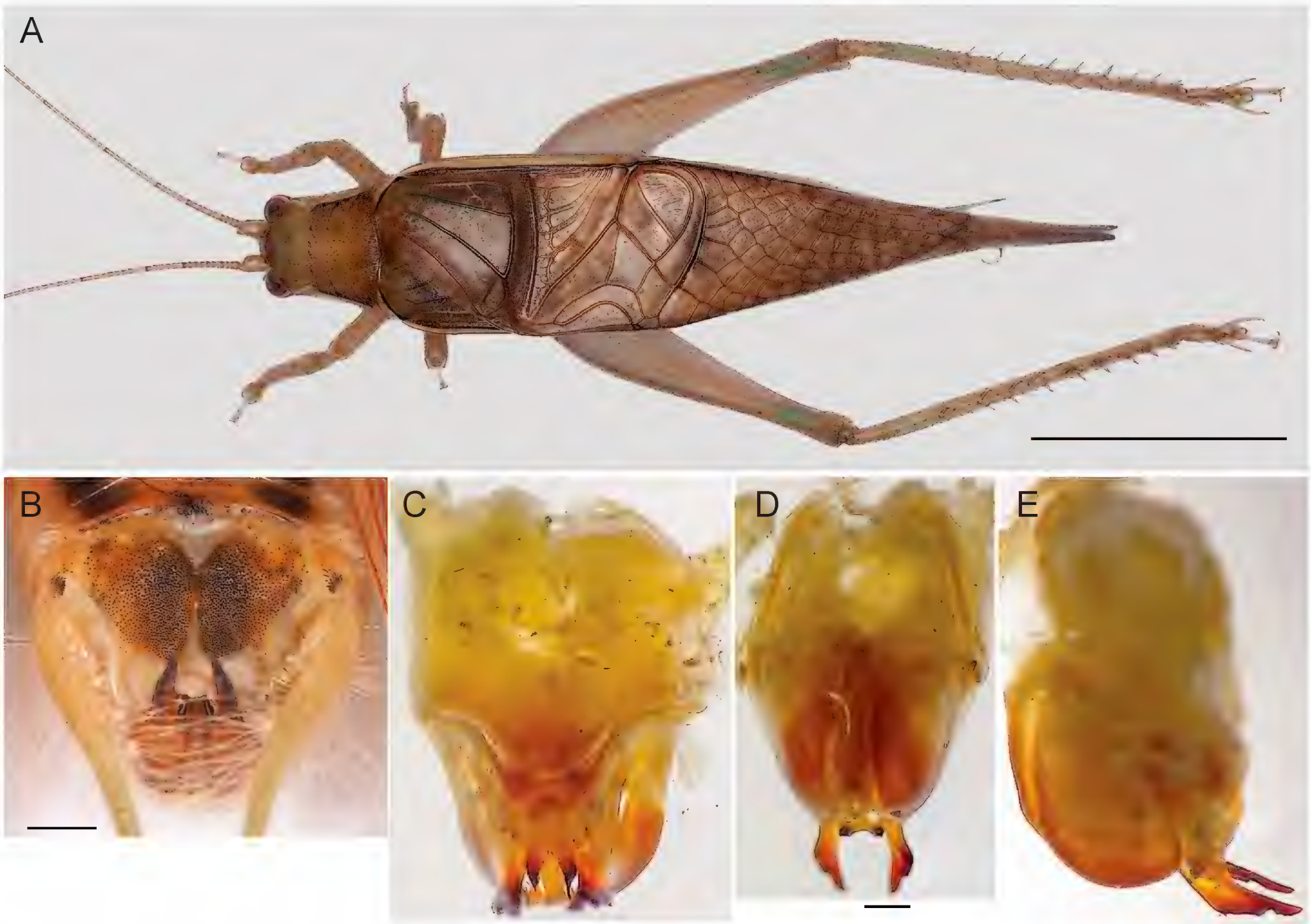

Fig. 31. *Sonotrella* (*Calyptotrella*) *lobata* (Chopard, 1969). **A.** Male habitus in dorsal view. **B.** Male abdominal apex in dorso-posterior view. **C–E.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 10 mm (**A**), 1 mm (**B**), 0.5 mm (**C–E**).

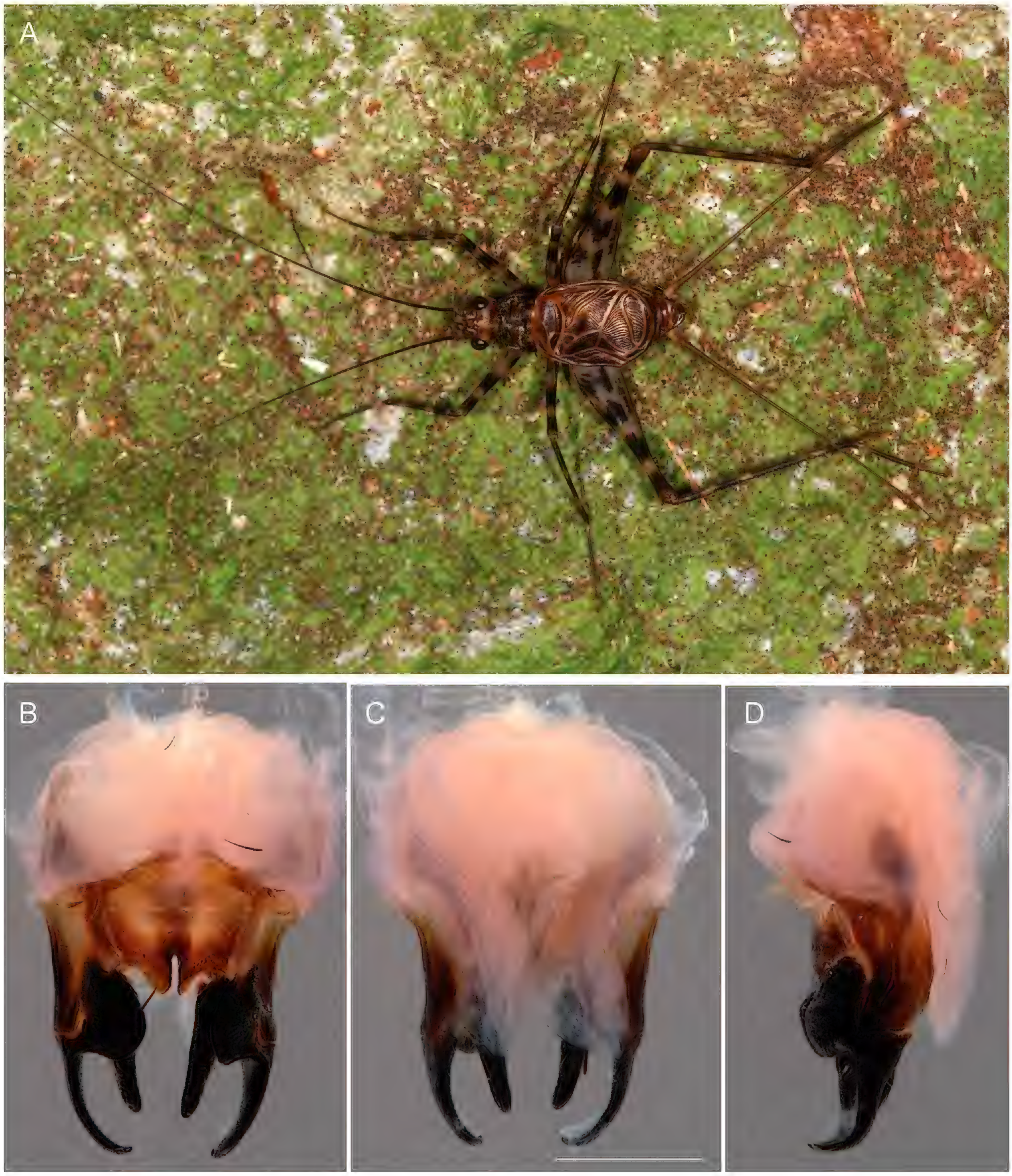

Fig. 32. *Parendacustes* (*Parendacustes*) *aduncus* Tan, Muhammad & Gorochov, 2024. **A.** Male adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

114.1±5.1 m.a.s.l.; 13 April 2025, 21h43; calling inside dried curled leaf; leg. M. K. Tan & A. A. Muhammad; JHR.25.49, ZRC.

Remarks.—This monotypic genus is characterized by the structure of its male genitalia: the pseudepiphallic parameres [= ectoparameres] and ectophallic apodeme [= endoparamere] absent, the ectophallic fold [= guiding rod] sclerites with a pair of large ventral projections, and rami short (Gorochov and Tan 2012). Previously known only from Singapore, this represents the first record of this genus outside its type locality. At night, males usually call while hiding among rolled-up dried fleaves on branches of small trees. Sometimes they can be found foraging among branches or trunks.

We also recorded its calling song, which does not differ drastically from the one from Singapore (Tan et al. 2024e): At 27.0°C, it consists of continuous trills, sometimes

Fig. 33. *Protrellius helverseni tioman* (Gorochov, 2011). **A.** Male adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

interrupted when disturbed. The average syllable duration is 8.9±0.2 ms (8.5–9.2 ms), average silent interval between consecutive syllables is 13.3±0.5 ms (12.6–14.0 ms), and the average syllable period is 22.1±0.4 ms (21.5–22.8 ms). The call spectrum consists of harmonics and has a peak frequency as the fundamental frequency of 5.26±0.03 kHz (5.22–5.32 kHz) and the second harmonics of a lower energy of 10.47±0.04 kHz (10.39–10.51 kHz).

Family Rhaphidophoridae
Subfamily Rhaphidophorinae

Rhaphidophorinae sp.
Fig. 36

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; peat swamp forest trail (Trail 16); 2.545189°N, 103.678743°E, 12.0 m.a.s.l.; 18 September 2024; 10h33; on forest floor; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.023, MZUM • 1♀; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 23h16; in a mud hole by the river; leg. A. A. Muhammad, Yip Jin Jet; HSGA2024.126, MZUM • 1♀; swamp forest in Gunung Arong Recreational Forest; 2.55514°N. 103.76369°E, 70.7±8.5 m.a.s.l.; 14 April 2025, 20h00; under rotten log; leg. M. K. Tan & A. A. Muhammad; JHR.25.55, ZRC • 1♂, 1♀; swamp forest in Gunung Arong Recreational Forest; 2.55514°N, 103.76369°E, 70.7±8.5 m.a.s.l.; 14 April 2025, 20h00; under rotten log; leg. M. K. Tan & A. A. Muhammad; JHR.25.54, 55, ZRC • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.55478°N, 103.76427°E, 71.4±12.1 m.a.s.l.; 14 April 2025, 21h22; on trunk of small tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.65, ZRC.

Remarks.—Species of this family are characterized by their highly arched body and wingless. This species can normally be found among leaf litter on the forest floor; however, one of our specimens was found in a mud hole just above the ground by the river. This group is speciose and can be difficult to identify for Southeast Asian representatives (Gorochov A.V. in litt.). Hence, we refrain from assigning species status to our specimen until the taxonomy of the group is resolved.

Family Tettigoniidae
Subfamily Conocephalinae

Nahlaksia bidadari **Ingrisch & Tan, 2012**
Fig. 37

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 19 September 2024; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.072, MZUM.

Remarks.—This species is generally brown with an irregular light and dark pattern, with a uniformly black face and covered in fine hairs. The wings in adults are strongly abbreviated (Ingrisch and Tan 2012). This specimen was collected underneath the foliage of understory plants, and the species has also been found dwelling among branches (Tan and Kamaruddin 2014). This species can be found in Singapore and Pahang state (Tan and Kamaruddin 2014).

Fig. 34. *Pteroplistes* sp. female adult in its natural environment.

Peracca tiomani **Gorochov, 2011 or**
macritchiensis **Tan & Ingrisch, 2014**
Fig. 38

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀ (nymph); Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 22h54; underneath rattan leaf; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.127, MZUM.

Remarks.—Body coloration of our specimen is greyish brown and rather spotted, with dark bands on the legs (femur and tibia); ovipositor gradually darkens toward apex. This specimen was found hiding among rattan leaves by the river at night. The two species are nearly indistinguishable based on morphology (other than small variation in the male cercus) (Gorochov 2015a) and bioacoustics (Tan et al. 2023, 2024c), and with only a female specimen from Gunung Arong, we cannot confirm the species name.

Viriacca viridis **Ingrisch, 1998**
Fig. 39

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂, 1♀; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; 22h04; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.086, HSGA2024.087, MZUM • 1♀; Taman Eko Rimba G. Arong; 11 April 2025; leg. M. K. Tan & A. A. Muhammad; JHR.25.20, ZRC.

Remarks.—This species is recognized by its bright yellow-green coloration with dark green markings and short wings that are partially covered by the pronotum. This species was found underneath the foliage of a tree in secondary forest. Widespread across Peninsular Malaysia (Cigliano et al. 2025, Ingrisch 1998), this species has also been recorded in Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024c).

Subfamily Hexacentrinae

Hexacentrus unicolor **Serville, 1831**
Fig. 40

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N,

Fig. 35. *Singapuriola separata* Gorochov & Tan, 2012. **A, B.** Male adults in their natural environment. **C.** Female adult in its natural environment. **D–F.** Male genitalia in dorsal, ventral, and lateral views. **G, H.** Oscillograms of male calling song and two syllables. Scale bar: 0.5 mm.

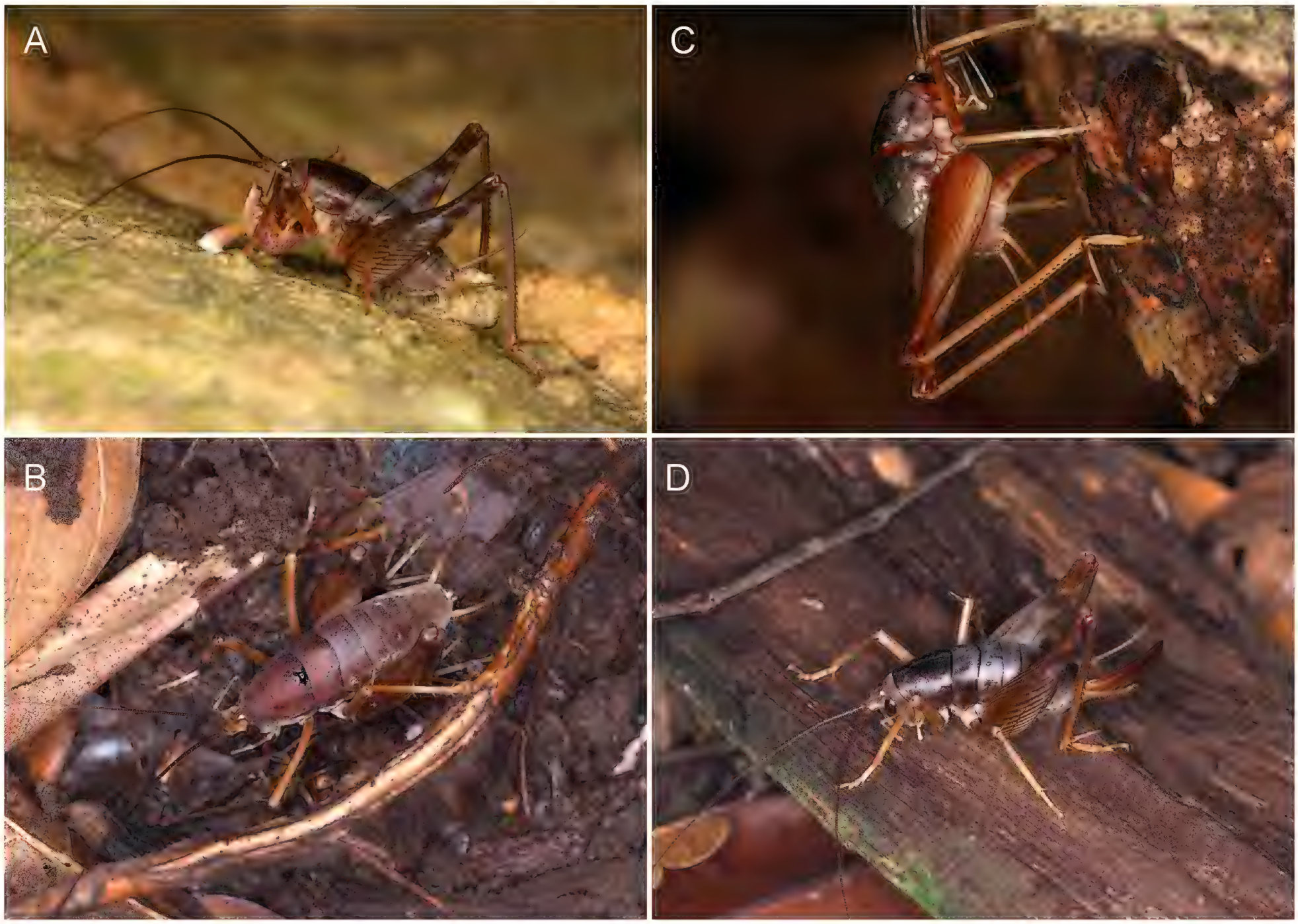

Fig. 36. Rhaphidophorinae sp. **A, B.** Male adults in their natural environment. **C, D.** Female adults in their natural environment.

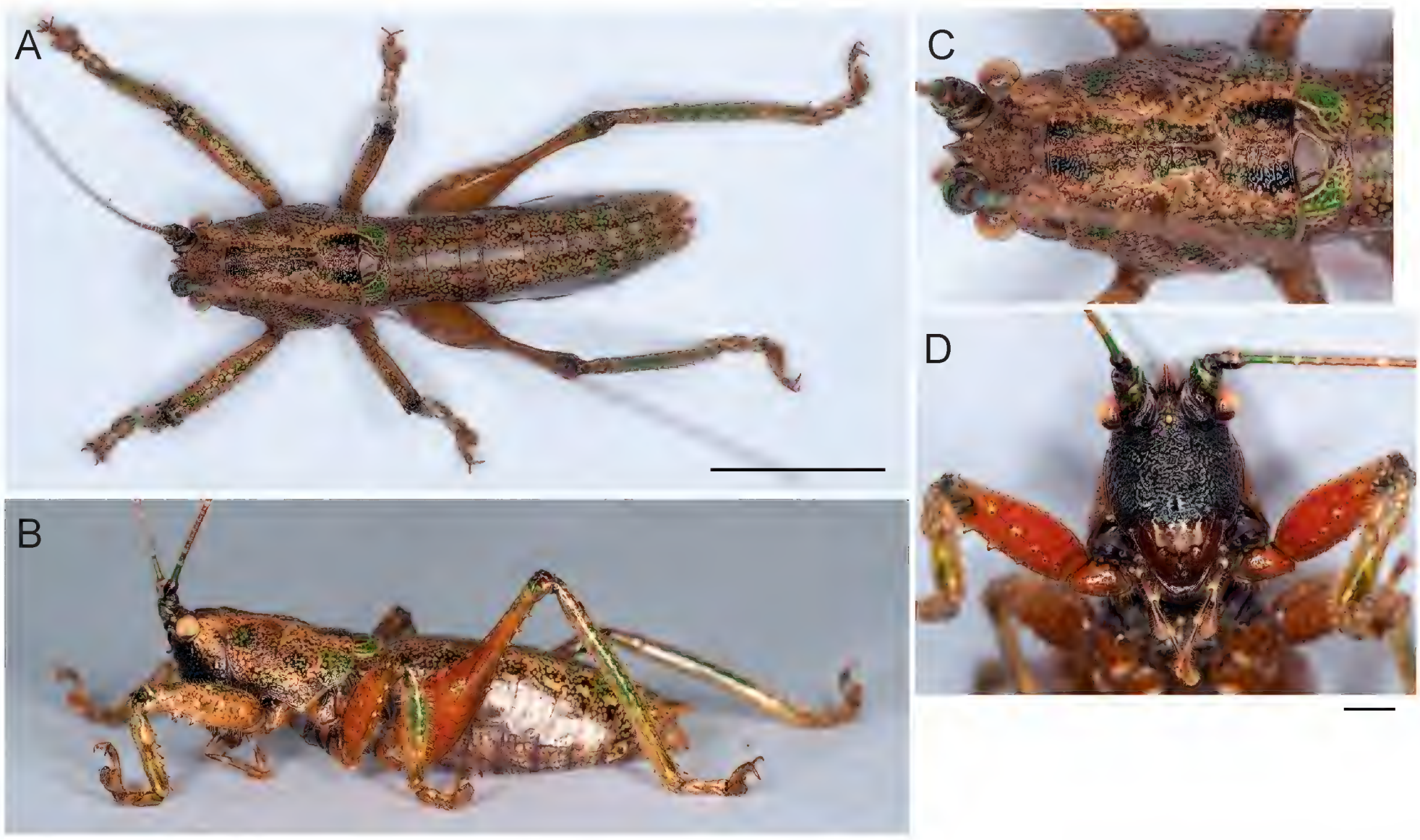

Fig. 37. *Nahlaksia bidadari* Ingrisch & Tan, 2012. **A, B.** Male habitus in dorsal and lateral views. **C.** Head, pronotum, and tegmina in dorsal view. **D.** Face in anterior view. Scale bars: 5 mm (**A, B**), 1 mm (**C, D**).

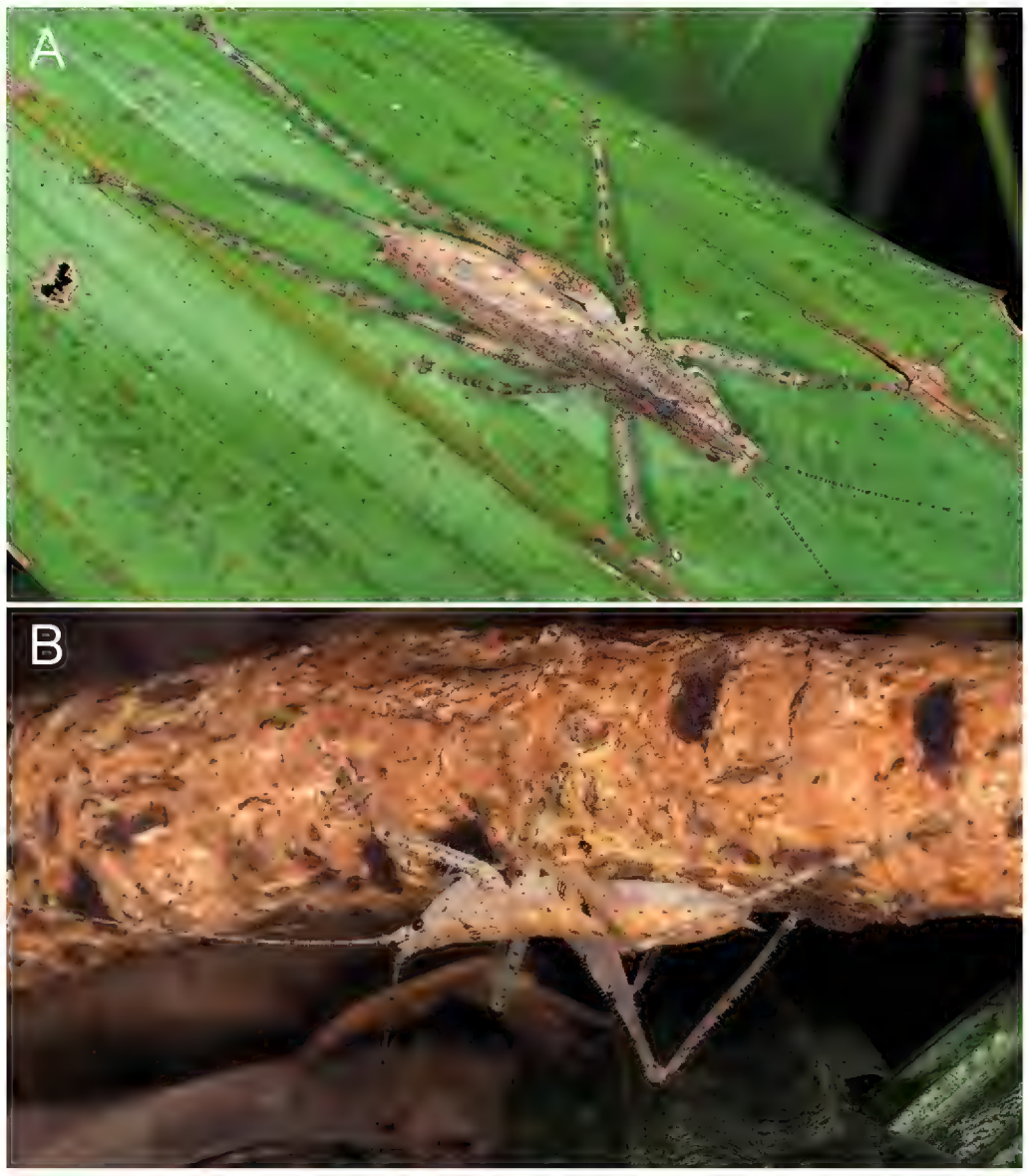

Fig. 38. *Peracca tiomani* Gorochov, 2011 or *macritchiensis* Tan & Ingrisch, 2014. **A, B.** Female and male nymphs in their natural environment.

103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 23h19; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.020, MZUM.

Remarks.—This species can be distinguished by the uniform green coloration, with a notable brown pattern on the dorsal of pronotum that extends from the vertex to the anterior part of forewings. Remarkably, the male has much broader tegmina, whereas the female is straight-winged (Tan 2017). This specimen was found on the foliage of understory plants at the forest edge, and it is also common among forest edges and grassy areas (Tan 2017).

Subfamily Lipotactinae

Lipotactes (*Dialipotactes*) *maculatus* **Hebard, 1922**
Fig. 41

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 22h30; on tree branch; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.006, MZUM • 1♂, 1♀; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; 21h25; on foliage; leg. Daicus M. Belabut; HSGA2024.082, HSGA2024.083, MZUM • 1♂; Kerangas forest near Tanjung Resang (Trail 4A); 2.5681°N, 103.81371°E, 21.5±5.6 m.a.s.l.; 10 April 2025, 21h37; on foliage near ground; leg. M. K. Tan & A. A. Muhammad; JHR.25.9, ZRC • 1♀; Taman Eko Rimba G. Arong; 11 April 2025; leg. M. K. Tan & A. A. Muhammad; JHR.25.26, ZRC • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.55429°N, 103.76522°E, 82.4±8.7 m.a.s.l.; 14 April 2025, 22h09; on foliage near ground; leg. M. K. Tan & A. A. Muhammad; JHR.25.67, ZRC

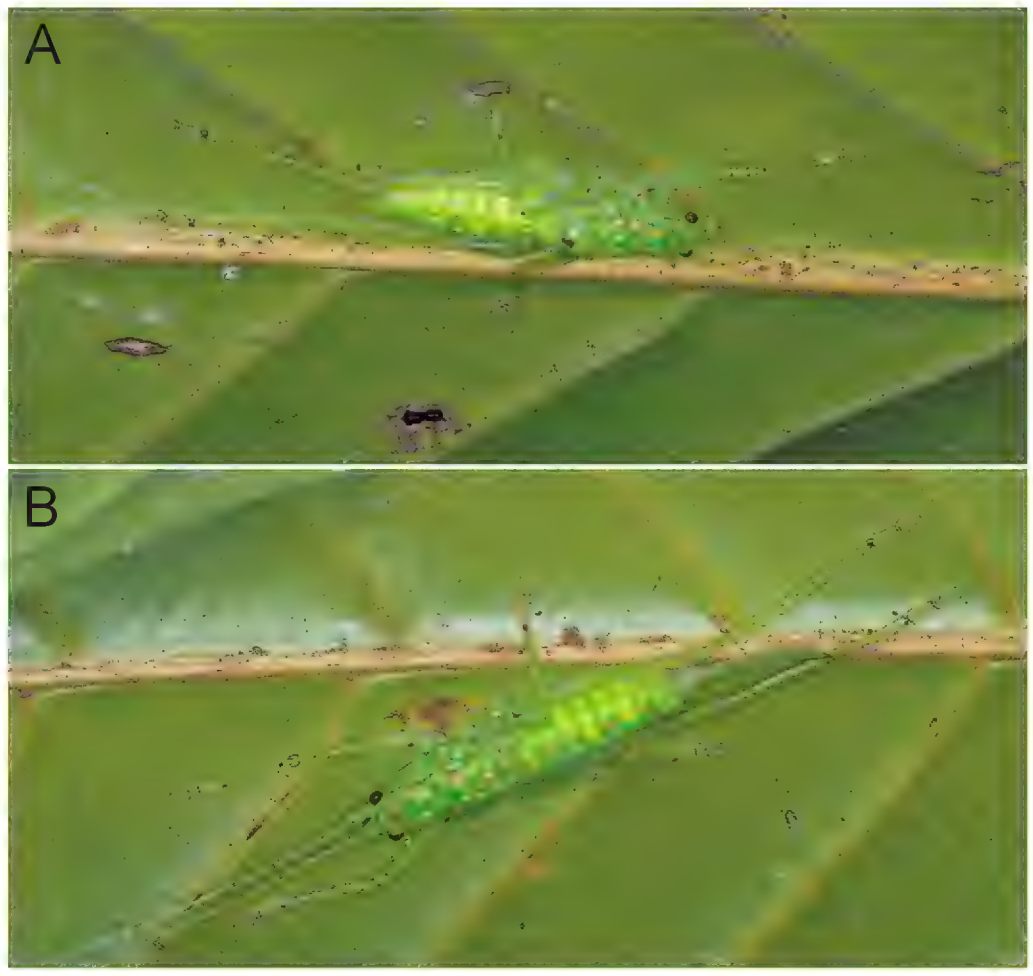

Fig. 39. *Viriacca viridis* Ingrisch, 1998. **A, B.** Male and female adults in their natural environment.

Fig. 40. *Hexacentrus unicolor* Serville, 1831. Male adult in its natural environment.

Remarks.—This species is commonly found among low vegetation or leaf litter, often among foliage or stems and branches (Tan et al. 2024c). This species is also much smaller than other species of *Lipotactes*, with dark bands across body and legs. Apart from this study, this species has also been recorded from Tioman island, Pahang, and Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024c).

Subfamily Meconematinae

Alloteratura (*Alloteratura*) **cf.** *lamella* **Jin, 1995**
Fig. 42

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 22h26; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.0120, MZUM.

Fig. 41. *Lipotactes* (*Dialipotactes*) *maculatus* Hebard, 1922. **A–C.** Male and female adults, and female nymph in their natural environment.

Fig. 42. *Alloteratura* (*Alloteratura*) cf. *lamella* Jin, 1995. **A, B.** Male adults in their natural environment.

Remarks.—This species is characterized by the body uniform light green with head and pronotum having dark green markings and the ventral surface of its sternites with bluish tint. Maxillary palpus with extremely short apical segment, much shorter than subapical (fourth) segment (Gorochov 2015b, Tan and Artchawakom 2017). This specimen was found underneath the foliage of a tree by the river. Although this specimen closely resembles *Alloteratura* (*Alloteratura*) *lamella*, more material is needed to confirm the species identity.

Asiophlugis rete **Gorochov, 1998**
Fig. 43

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 17 September 2024; 22h21; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.009, MZUM • 1♀; Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 22h09; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.039, MZUM • 1♀; Ulu Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 22h28; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.040, MZUM • 1♀; Ulu Sungai Pucong Trail (Trail 3); 2.5737°N, 103.801159°E, 60.0 m.a.s.l.; 20 September 2024; 22h45; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.118, MZUM.

Remarks.—This species is small-sized and bright green, almost translucent under illumination, with large globular eyes. This species is typically found under the foliage of trees in the secondary forest. Widespread across Sumatra, Thai-Peninsula, and Malay Peninsula, this species was also recorded from Panti Forest Reserve in Kota Tinggi, Johor state (Tan et al. 2024c). This species is rare in Singapore but appears the dominant *Asiophlugis* species in Johor state.

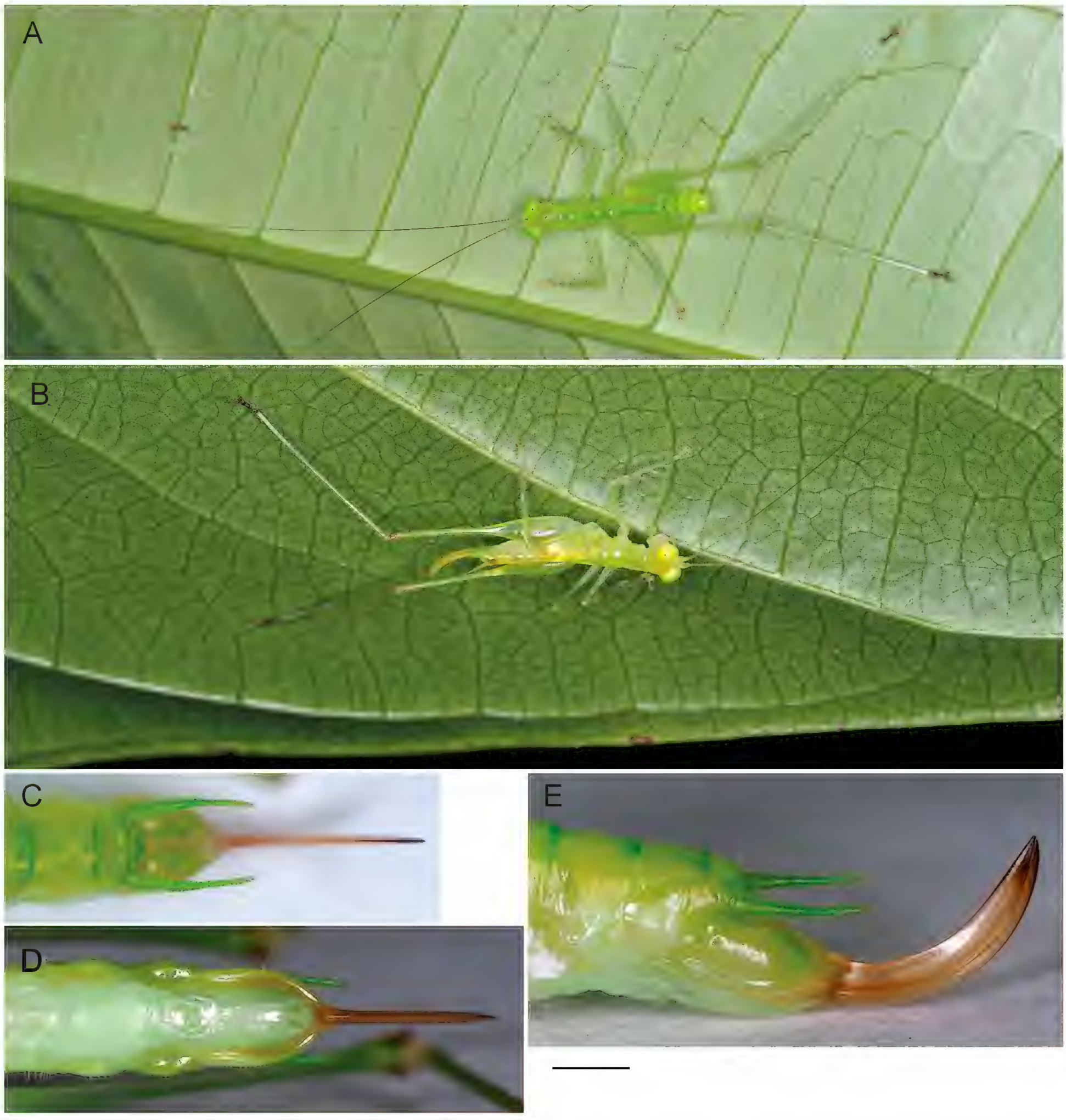

Fig. 43. *Asiophlugis rete* Gorochov, 1998. **A, B.** Male adult and female nymph in their natural environment. **C–E.** Female abdominal apex in dorsal, ventral, and lateral views. Scale bar: 1 mm.

Carliphisis leontopolites **(Karny, 1931)**
Fig. 44

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Pantai Teluk Gorek (Trail 7); 2.54802°N, 103.82321°E, 39.6 m.a.s.l.; 18 September 2024; 22h09; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.041, MZUM • 2♂; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 18 September 2024; 23h17; underneath foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.046, HSGA2024.047, MZUM • 1♀; Kerangas forest near Tanjung Resang (Trail 4A); 2.56786°N, 103.81353°E, 33.8±7.1 m.a.s.l.; 10 April 2025, 21h25; under foliage of tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.4, ZRC.

Remarks.—Found underneath the foliage of understory plants, this forest-restricted species is considered rare (Tan 2017). The distribution ranges from Singapore (type locality) to Tioman Island in Pahang; it is therefore not surprising that this species is also found at Gunung Arong near Tioman Island.

Subfamily Mecopodinae

Mecopoda elongata **species group (Linnaeus, 1758)**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; 21h33; on foliage; leg. Daicus M. Belabut; HSGA2024.080, MZUM.

Remarks.—This species is a large katydid, either appearing in brown or green coloration. Regarded as a common katydid (Muhammad AA pers. obs., Tan 2017), it can be found on grass, shrubs, and trees. The species from Southeast Asia has undergone a few taxonomic revisions (Gorochov 2020, Heller et al. 2021), but it remains difficult to identify the specimens to species, especially with only one female specimen. As such, we identify this species only to the species group.

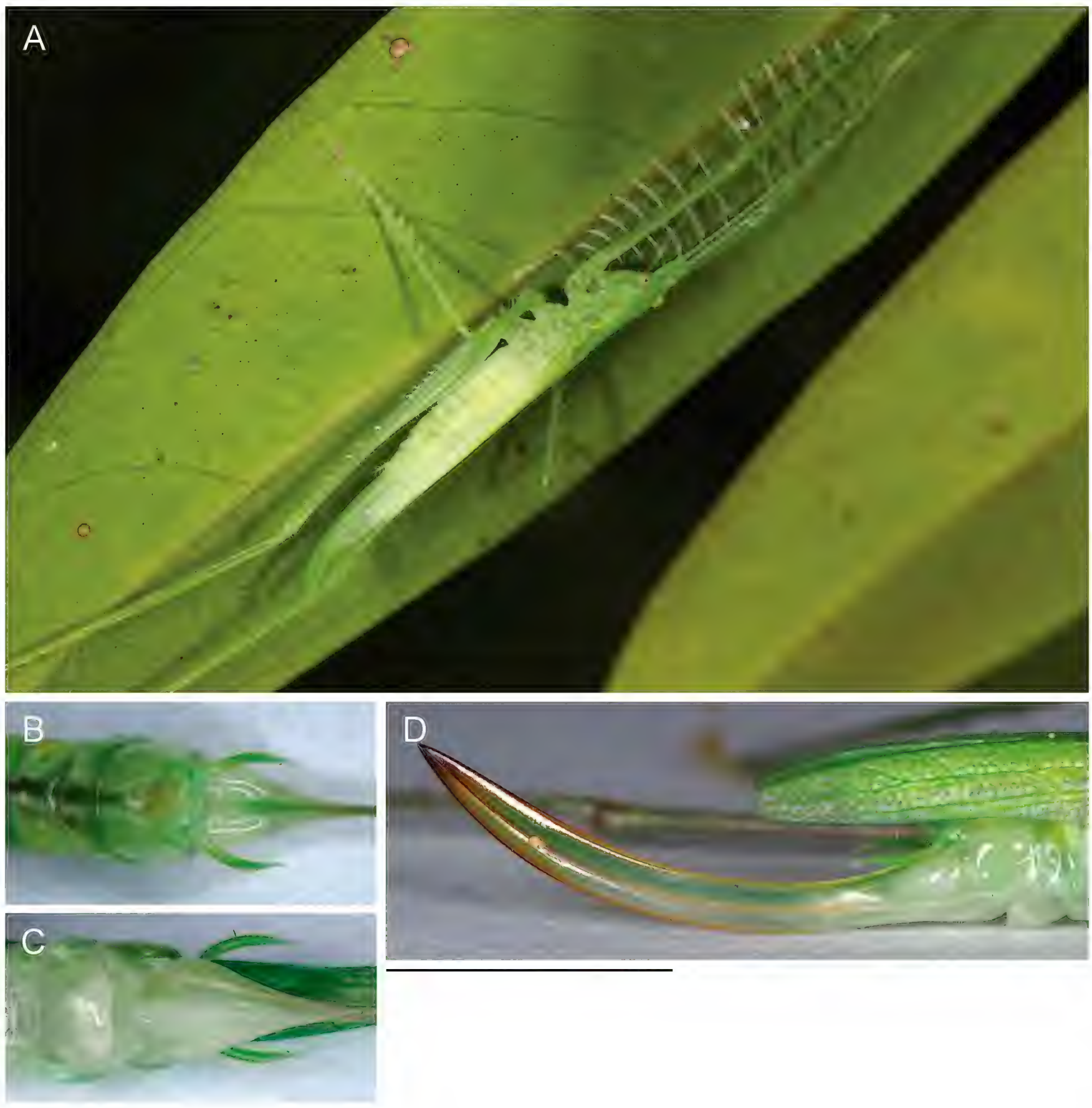

Fig. 44. *Carliphisis leontopolites* (Karny, 1931). **A.** Female adult in its natural environment. **B–D.** Female abdominal apex in dorsal, ventral, and lateral views. Scale bar: 1 mm.

Subfamily Phaneropterinae

Cesasundana lorniensis Tan, 2014
Fig. 45

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Trail 10; 2.53567°N, 103.77581°E, 32.2 m.a.s.l.; 19 September 2024; 21h12; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.085, MZUM.

Remarks.—This species is characterized by the dorsal surface of the abdominal tergite with bluish tint, the ovipositor of this species greatly reduced and hardly exceeding cerci (Tan 2014b, 2014c). Specimen was collected on the foliage of a tree in the secondary forest at night. Outside of its type locality in Singapore (Tan 2014c), this finding represents the first record of this species from both Johor state and Peninsular Malaysia.

Scambophyllum sanguinolentum (Westwood, 1848)
Fig. 46

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1 juvenile; Trail 8; 2.55636°N, 103.74748°E, 28.2 m.a.s.l.; 20 September 2024; 16h17; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.107, MZUM • 1♂; swamp forest in Gunung Arong Recreational Forest; 2.5551°N, 103.76404°E, 100.3±9.6 m.a.s.l.; 14 April 2025, 20h34; on foliage of small tree; leg. M. K. Tan & A. A. Muhammad; JHR.25.57, ZRC.

Remarks.—This species can be found on foliage of understory plants, and nymphs are distinctly different from the adult (black with white spots, whereas the adults have bright orange and red hind wings) (Tan 2017). This species is characterized from other congeners by the wide tegmen, basal part of the fore margin strongly emarginated, and the hindwing having broader and denser red

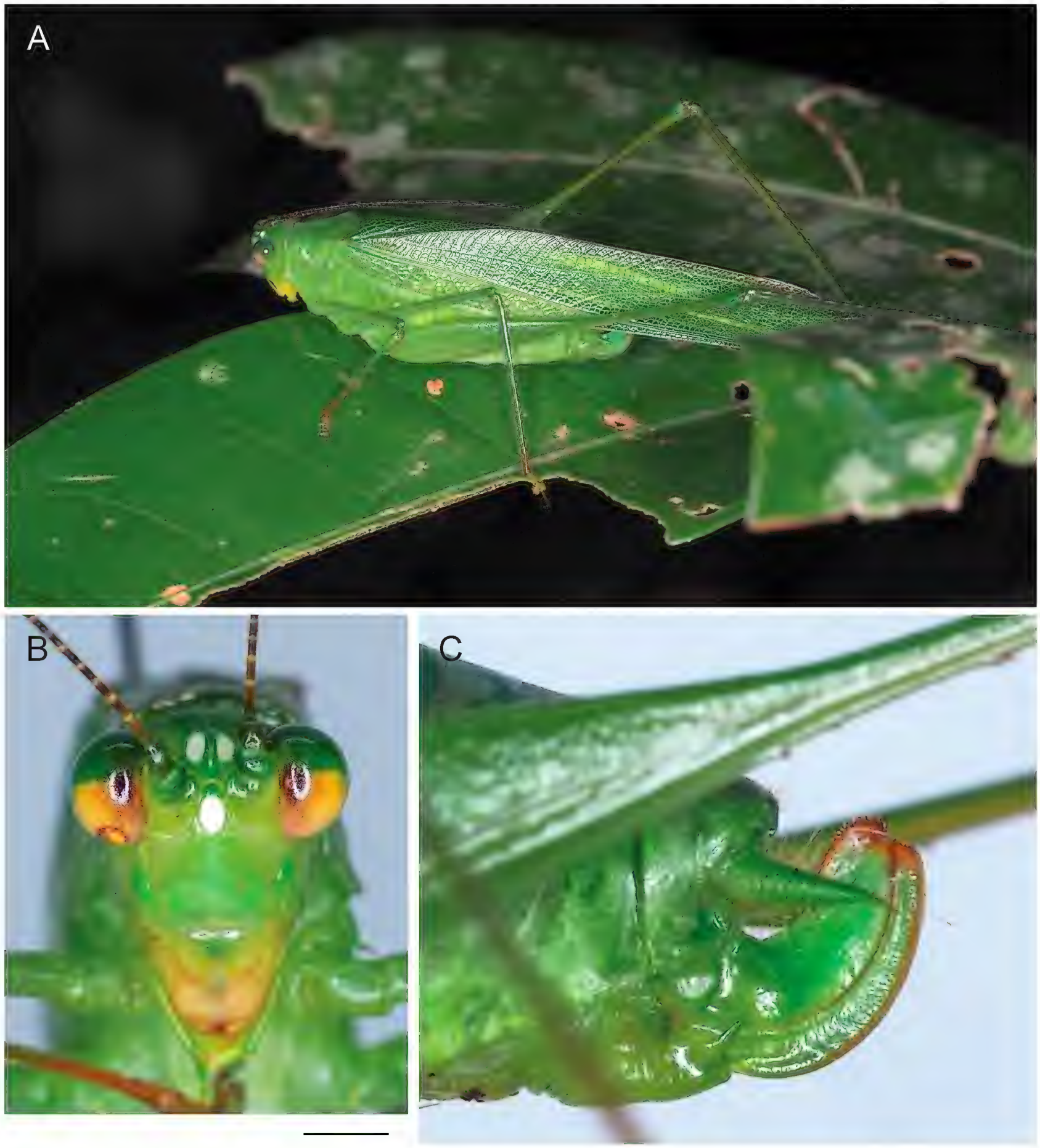

Fig. 45. *Cesasundana lorniensis* Tan, 2014. **A.** Female adult in its natural environment. **B.** Face in anterior view. **C.** Female abdominal apex in lateral view. Scale bar: 1 mm.

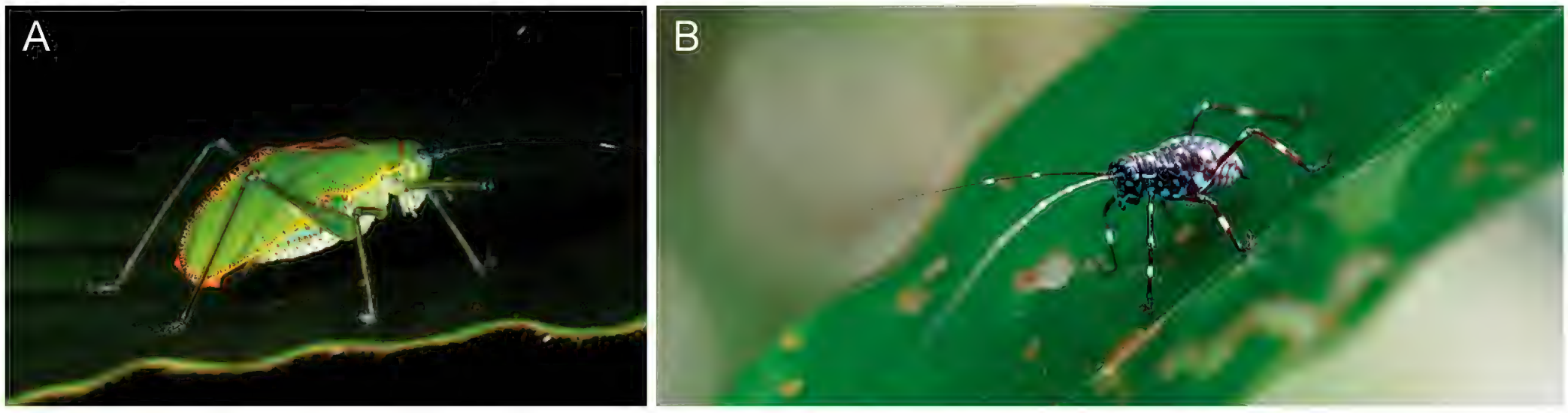

Fig. 46. *Scambophyllum sanguinolentum* (Westwood, 1848). **A, B.** Male adult and nymph in their natural environment.

cross bands. This species has been recorded in Johor State (e.g., Mount Ophir [= Gunung Ledang]) and Singapore (Karny 1926); therefore, it is not surprising that it is also found in Gunung Arong.

Subfamily Pseudophyllinae

Onomarchus uninotatus **(Serville, 1838)**
Fig. 47

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♀; Taman Eko Rimba Gunung Arong (Trail 13); 2.552934°N, 103.754639°E, 29.1 m.a.s.l.; 18 September 2024; 23h42; on foliage; leg. Badrulhadza A., M. Iman Z., M. Akmal Hidayat Z., M. Izzuddin A.; HSGA2024.051, MZUM.

Remarks.—This forest-restricted species is characterized by the green coloration and broad tegmina, with one or two white spots near their base in the females (de Jong 1939). Widespread across Southeast Asia (Cigliano et al. 2025), Tan et al. (2019) suggested further investigation into this complex species owing to size and morphological variations.

Family Trigonidiidae
Subfamily Nemobiinae

Eumarinemobius sundaicus **Gorochov & Tan, 2018**
Fig. 48

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂, 3♀; Kerangas forest near Tanjung Resang (Trail 4A); 2.56775°N, 103.81374°E, 27.8±7.4 m.a.s.l.; 10 April 2025, 21h30; sandy bank, mangrove; leg. M. K. Tan & A. A. Muhammad; JHR.25.5–8, ZRC.

Remarks.—This species is restricted to mangroves, found dwelling among aerial roots of mangrove trees and muddy or sandy substrate, but this species is widely distributed from Thailand, Malay Peninsula, and Sarawak (Gorochov et al. 2018). This apterous species is characterized by the more robust body and the male genitalia (Gorochov et al. 2018).

Pteronemobius **(***Pteronemobius***)** *indicus* **(Walker, 1869)**

Material examined.—PENINSULAR MALAYSIA: Johor State: GAFR • 1♂; Trail 12; 2.53906°N, 103.772547°E, 42.1 m.a.s.l.; 19 September 2024; 09h26; on foliage; leg. A. A. Muhammad, I. A. Azizan, N. A. Abdullah; HSGA2024.054, MZUM.

Fig. 47. *Onomarchus uninotatus* (Serville, 1838). Female adult in its natural environment. Photograph by Badrulhadza Amzah, reproduced with his permission.

Remarks.—Members of this genus are characterized by the four internal spines on the posterior tibiae of males, with the first spine very short and tuberculiform (Chopard 1969). This species is larger than its congeners and was found on foliage of understory plants during daytime.

Discussion

GAFR shares similar species—*Duolandrevus* (*Bejorama*) *firmus tioman* Gorochov, 2016; *Protrellius helverseni tioman* Gorochov, 2011; *Lipotactes* (*Dialipotactes*) *maculatus* Hebard, 1922; and *Carliphisis leontopolites* Karny, 1931—to Tioman island, which is situated off the coast of Mersing. The first three species mentioned are also found in Panti Forest Reserve, which is located roughly 100 km south of GAFR. *Asiophlugis rete* Gorochov, 1998 and *Viriacca viridis* Ingrisch, 1998 are widespread across Peninsular Malaysia and can also be found in nearby localities such as Panti Forest Reserve (Tan et al. 2024c).

Owing to the lack of studies of orthopterans from Johor state until recently, most species collected in GAFR in this study represent the first published record for the state, even for very common and widespread species. Nevertheless, some new locality records hold added significance. Our study in GAFR also revealed a wider distribution of some species thought to be endemic to Singapore. These include the monotypic genus *Singapuriola*, *Ectatoderus angusticollis* Chopard, 1969, *Ornebius xinyao* Tan, 2015, and

Fig. 48. *Eumarinemobius sundaicus* Gorochov & Tan, 2018. **A.** Female adult in its natural environment. **B–D.** Male genitalia in dorsal, ventral, and lateral views. Scale bar: 0.5 mm.

Cesasundana lorniensis Tan, 2014. Likewise, *Odontogryllodes undatus* Tan, Muhammad & Abdullah, 2024 and *Parendacustes* (*Parendacustes*) *aduncus* Tan, Muhammad & Gorochov, 2024 are two species only recently discovered and named from Panti Forest Reserve. We now know that these species can also be found in other parts of Johor state, at least in GAFR. As more samplings are conducted in other parts of Johor state, we will be able to better understand the species distribution of existing species in this part of the Malay Peninsula and potentially discover more species new to science.

Some taxa require further taxonomic work before identification can be done reliably and accurately. Unfortunately, few specimens were unable to be determined up to species level for

several reasons, including taxonomic complexity and lack of materials (i.e., references and specimens). Pygmy grasshoppers of the genus *Coptotettix* are taxonomically problematic, and revision is needed to correctly classify the species under these families (Adžić 2021). For some ensiferans, such as *Agryllus* or *Acanthoplistus* sp., *Micrornebius* sp., *Xabea* sp., and Rhaphidophorinae sp., broader generic-level taxonomic revisions or reviews are necessary before we can reliably identify the species from GAFR. *Cardiodactylus reticulatus* Gorochov, 2014 or *singapura* Robillard, 2011 and *Peracca tiomani* Gorochov, 2011 or *macritchiensis* Tan & Ingrisch, 2014 are two instances in which species were described from Tioman Island and Singapore, respectively, but are difficult to distinguish morphologically. As such, it is not entirely clear how material between these two islands in Johor state should be identified. This also highlights the importance of sampling in these parts of Johor state to advance the taxonomy of these potentially cryptic species.

This study has shown that a diverse ecosystem consisting of multiple forest strata hides a plethora of biodiversity in terms of orthopterans. Due to its close proximity to Mersing, GAFR not only acts as a habitat to orthopteran species of the mainland peninsula but also caters to species found on nearby islands such as Tioman. Moreover, both these localities are comprised of lowland dipterocarp forest, highlighting the dispersal abilities of the orthopteran species between the island and nearby mainland forests (Grismer et al. 2004). We believe that increasing sampling effort will yield greater insight into the Orthoptera of this area and the discovery of more species. Expanding the survey during other seasons is imperative to better reflect on the species diversity and composition of the Orthoptera of GAFR and, reflectively, of the eastern region of Johor state.

Acknowledgments

The authors are grateful to the Johor State Forestry Department (Jabatan Perhutanan Negeri Johor), the Forestry Department of Peninsular Malaysia (Jabatan Perhutanan Semenanjung Malaysia), and the committee members from various institutions for organizing the scientific expedition from September 17 to 21 2024. The work of the first author for the second sampling session was supported by the Lee Kong Chian Natural History Museum (LKCNHM) Collection Study Grant for Students. The authors also thank Noorhidayah Mamat, Yong Kien-Thai, Daicus M. Belabut, Badrulhadza Amzah, Yip Jin Jet (Wildlife Conservation Society, Malaysia), Muhammad Izzuddin Abdullah, Leong Qi Jia, Shyam Venkatachalam, Muhammad Akmal Hidayat Zulkifli, and Mohamad Iman Zulkiflee for their assistance and support during the first sampling session (September 17 to 21, 2024) and to Mohd Shahrulnizam bin Murat, Muhammad Rizal bin Yunos, and Harun bin A. Rahaman during the second sampling session (April 10 to 15, 2025). Permission to conduct the second sampling session was granted by the Johor State Economic Planning Division (SUKJ.BPEN.700-3/2/2 (1) (25)) and the East Johor Forestry Office (permit ref. no.: PHDJT.192/687/2 Jld. 53 (134)).

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